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ABSTRACT

This report is based on presentations given at the workshop arranged jointly by the DELTA (Developing European Learning through Technological Advance) Unit of DG XIII/F and the Italian based Datamont spa. The workshop addressed three principal themes: markets for technology-based learning, standards and conventions for technology-based learning, and the effectiveness of technology-based learning. For each theme the report includes presentation of the issues by commission staff, a transcript of the major speech from the invited expert, and abstracts of supporting presentations from invited experts. The purpose in collecting these papers is to offer a synthesis of findings and provide a baseline for further research in the area of telematic systems for flexible and distance learning. After a preface by Roland Huber, the following papers are presented: (1) "Background to the Workshop" (Corinne Hermant and Lieve Van Langenhove); (2) "Markets and Standards in Learning Technologies" (Luis Rodriguez-Rosello); (3) "Markets for Technology-Based Learning" (Corinne Hermant and Lieve Van Langenhove); (4) "La prise en compte des couts dans les strategies de production des nouvelles technologies de formation"--French title; "Where Are the Markets for Technology-Based Learning?"--English title (Jean-Marie Albertini and Joel Bonamy--in French with English summary); (5) "Small and Medium Enterprises" (Carlos Braga--abstract); (6) "Corporate Training" (Ronnie Dallal--abstract); (7) "User Requirements for Technology-Based Learning" (Chris Lloyd--abstract); (8) "Standards and Guidelines for Technology-Based Learning" (Corinne Hermant and Lieve Van Langenhove); (9) "Which Standards and Conventions Are Appropriate for Advanced Learning Technology in Europe?" (Giuseppe Sala); (10) "Standards for the Design, Production and Use of Learning Technology" (Willem Bulthuis Philips--abstract); (11) "Standards for Learning in European Networks" (Joseph Fromont--abstract); (12) "Effectiveness of Technology-Based Learning" (Corinne Hermant and Lieve Van Langenhove); (13) "Effectiveness of Flexible and Distance Learning in Terms of Investment and Learning Progress" (Geoff Toplis); (14) "Investing in Learning Technologies" (Ulla Schwarz--abstract); (15) "Learning Efficiency of New Technology" (Glyn Martin--abstract); and (16) "Policy Issues" (Claudio Dondi--abstract). (DB)

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Markets and Standards for Advanced Learning Technology

Edited by Corinne Hermant and Lieve van Langenhove

April 1991

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This booklet is based on presentations given at the workshop arranged jointly by the DELTA Unit of DG XIII/F and the Italian based Datamont spa, a partner in DELTA project OSIRIS, in December 1990 on the topic 'Markets and standards of Advanced Learning Technology'. The workshop consisted of three principal themes:

- Markets for technology-based learning
- Standards and conventions for technology-based learning
- Effectiveness of technology-based learning

For each theme the document includes

- Presentation of the issues by Commission staff
- Transcript of major speech from invited expert
- Abstracts of supporting presentations from invited experts

The overall aim in collecting these papers is to offer both a synthesis of the findings of the DELTA Exploratory Action in the crucial areas of market and standards and to provide a base-line for further research in the area of telematic systems for flexible and distance learning.

Thanks are due to the authors who have contributed to this document for their willingness to participate and for their cooperation in preparing their contributions. Acknowledgement should be extended to the DELTA project, EIOL for their help with this document. Finally, thanks also to DATAMONT spa for their kind and efficient hosting of the workshop in Milano and to all the DELTA team, especially Anne Marie Fynbo and Alan Huyton for their contributions and help in arranging the workshop and these proceedings.

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Preface: A Future for Distance and Flexible Learning

Roland Hüber, Director DGXIII/F

Since the early 1960s experts have been predicting the dawn of the "information society", where access to and use of information would become more important than manual labour. Europe, today, is at the beginning rather than the end of this long-term transition. Over the next few years, technological progress, economic integration and the internationalisation of the economy, will all proceed at an accelerated pace and the true depth and complexity of an information-led economy will become apparent.

During the 1980s, the industrialised societies have experienced a significant change in character, moving away from the mass-production monolith economy to one driven by the need to cater for quality and individual taste. More specialised demands means a more fragmented and diverse market place. Manufacturing and services must become more flexible in order to adapt, re-adapt and remain competitive. This process, which can be termed as a shift from a techno-economic perspective to a socio-economic dynamic, has had and will have far-reaching consequences on the way society is organised. Education and training must grow out of the niche allocated to them. Now they must become adaptable, both serving the flexible economy and being an integral part of the new quality of life. It is not a question of replacing traditional approaches to training with new more efficient methods. It is more a case of opening-up new possibilities to groups previously unable to receive suitable (if any) training. This could be done through combining the availability of new technology and advanced telecommunications with the techniques and advantages of distance learning. It was against this background that the Community's DELTA Programme was developed and a 24 month Exploratory Action was initiated. The action was to be a catalyst for the diverse actors in the Advanced Learning Technology (ALT) sector and a key part of its work would be to examine the state and future of the market for ALT based training products.

As part of the DELTA Exploratory Action, a series of workshops were organised, including one on the necessary electronic infrastructures required to allow access to skills-updating whenever and wherever it was required, one on how this could be translated into R&D tasks and one on the practical economic aspects from the point of view of the buyer and seller of ALT products. The approach taken defined training as a market which must develop and progress on the basis of market forces, requiring the rigours of the cost-benefit and cost-effectiveness approach.

The relative infancy of the domain and the products themselves has meant a rather scattered and uneven market. Patterns of supply and demand have been difficult to identify and predict. Clearly, buyers will need to be convinced not only of the technological capability of ALT but of its cost-effectiveness in providing an answer to their needs.

In common with its sister programmes, DELTA has examined the question of interoperability and standards. This work has looked at both the logic and, to a lesser extent, the recommendations for technological protocols underlying such areas as

interfacing computers and video-disks, courseware architecture etc. However, 'technical standards' are largely the prerogative of programmes, RACE and ESPRIT for example. The development of recommendations of standards in areas such as learner modelling, pedagogical effectiveness or appropriateness, common terminology and courseware design, has been a process specific to DELTA. But not only that. The work done on these standards has been fundamental to the key question of identifying and then providing a framework for the meeting of users' requirements. This in turn brings us back to the market and potential development of distance and flexible learning infrastructures as well as saleable and workable products and services on a European level.

With this background in mind, the workshop on Markets and Standards for advanced Learning Technology gave sector actors the chance to participate in and benefit from an open public discussion, tackled a number of questions: Is a European market feasible and identifiable? How able are the suppliers to meet the needs of industry? Are 'the buyers' a sufficiently homogeneous and large group to permit mass production methods? Can technical and other standards really make ALT products more accessible?

This document is a resume of the workshop presentations and debate. The contributions from the authors represent detailed thinking on specific aspects to the training problem and are gratefully acknowledged. As a whole the dossier represents a most useful base of knowledge and opinion for suppliers and future researchers.

Background to the workshop

Corinne Hermant and Lieve Van Langenhove, DELTA Central Office

Background

The specific mandate of the DELTA Exploratory Phase has been to identify requirements, opportunities and actions for research and to make recommendations to the actors who are working in the area of Advanced Learning Technology.

This workshop was organised in order to present some of the results of the research carried on within the Action Lines I, IV and V of DELTA. These address respectively the learning system research, the interoperability of technical standards and the favourable conditions for the uptake of the market. More details on the DELTA projects referred to in this document can be found in the DELTA Final Technical Report¹, available from the DELTA Central Office.

A second objective of the workshop is to look into problematic research areas such as the users' requirements, the assessment of markets, the technology impact evaluation, more effective technology-based services and learning materials and the provision of adequate standards.

The rationale behind the DELTA Exploratory Action is the investigation into how learning technologies meet the crucial challenges of:

- a skilled workforce in Europe
- cost effective and pedagogically efficient solutions for training.

Training needs economic and social solutions. This is especially crucial when traditional services do not fulfil the requirements. The work carried on in DELTA has demonstrated that education and training must be seen as an investment, as a product and as a service. The proper bridges between human resources and technology have to be found.

A group of industrialists, led by Sir Robert Telford, under the scheme of the IRDAC Advisory Committee of the Commission, has just investigated the problem of 'skills shortages' in Europe. One of their four main conclusions is that, within the

"European investment in human resources, training tools and technology, a large

*structural effort in distance and flexible training is required in Europe"*²

The Exploratory Phase of DELTA is achieving important results in this respect.

The overcoming of market barriers is a crucial issue for the development of learning technologies. Several projects have examined the demand aspect. They have studied the market segmentation in the training environment, attempting to gauge the "fitness" of particular technologies for different market segments. Some have looked at the problems faced by the producers, putting forward recommendations for improving the quality of the European supply. Some have focussed on the potential role of the public policies in this complex environment. Case studies of successful products have been produced to provide a series of criteria to analyse success or failure in the use of technology for training. An inventory of best practices in the production process of technology-based learning materials is being made.

Overcoming technical barriers and standards is another key issue in the work being done under the Exploratory Phase of DELTA. The effort is directed mostly at the problem of improving the portability of software between different operating systems. There are, at present, no specific standards for educational technology. A great effort has been made to recommend specifications, conventions and standards for advanced learning technology on top of existing and emerging standards and conventions as defined in RACE and ESPRIT. Some projects have focussed on the identification of common and standardised systems architecture for authoring and learning environments. Others have investigated interfacing and communication protocols for telecommunication applications in training. Focus has also been put on methodologies in the design and production areas.

The effectiveness of the technology for learning is a third key issue for any technical work done under DELTA. A severe problem in the market is the gap between the potential of learning technologies and the practice. The reasons for this gap derive from the absence of overviews on 'what' is on the market. This gap is also due to the lack of

1 DE2205, May 1991

2 IRDAC Working Party 11 - Report on skills shortages - September 1990

research into 'why' some initiatives on flexible and distance learning are successful whilst others are not. Evaluation of learning technologies in terms of cost effectiveness and pedagogical efficiency is a relatively undeveloped and disparate field. Some results within DELTA, from an economic, organisational and pedagogical viewpoint, will be intensively discussed during this workshop. The shared objective of DELTA research is to create new levels of efficiency - and hence cost savings - in the learning process.

To conclude, some figures should be recalled. Learning is one of the few processes every citizen is exposed to. In Europe, 22% of the population are in some form of full time education at any one time, and more than 10M undergo some form of training or re-training every year. This amounts to 85M people in education or training each year¹. This accounts for just under 1/3rd of the EC population.

These figures give a concrete idea of the challenges raised by the need and pursuit of new investments in this area.

The Workshop

Over 60 experts from 10 different countries gathered together on an overcast day in the pleasant surroundings of Ipsos Scuola d'Impresa's base in Milanfiori. Luis Roselló, Head of the European Commission's DELTA office, opened the proceedings together with Signor Pesara of Scuola d'Impresa, kind hosts for the day. Their speeches and a summary of the lively presentations and discussions which followed form the basis for this document. A list of attendees can be found at the back.

1 Eurostat 1989, to be published

Opening Address

Markets and standards in learning technologies

Luis Rodriguez-Roselló, Head of DELTA Unit

Introduction

This workshop is an event attempting to disseminate the results of the DELTA Exploratory Action and to analyse its findings and their relations with the future perspectives in the field.

It has been organised by the Commission with the support and kind hospitality of the DATAMONT Group, which is also a partner in DELTA.

The organisation of this workshop, devoted specifically to the market issues of learning technologies, is an explicit acknowledgement of their strategic importance. This represents a shift in emphasis in the field of learning technologies, towards fulfilling users' requirements (this is the main interpretation of the "market" concept in this context).

This means that there is a concern on how to implement solutions to real problems, instead of creating new more sophisticated technologies for their own sake. Widening the gap between technologies and their actual use would be a narrow approach. If the solutions are to be implemented, accepted by the users and meet the objective of improving learning Europe-wide there is a need to look at the market issues. Any R&D effort neglecting this aspect will very likely end in a 'cul-de-sac'.

The above reflections raise two other related issues which will be addressed during this workshop:

- Learning technologies components and systems must be integrated in a standardised context which guarantees interoperability.
- Market integration, technical integration and harmonisation are only possible through the identification of the appropriate standards.

They are a pre-requisite; without endorsed standards, markets are unlikely to develop.

Another key issue which is going to be addressed in this workshop is the effectiveness of the solutions provided by these technologies, in terms of the users, what we can call learning efficiency and the potential for returns of the investments made.

The Advanced Learning Technologies Markets

The importance of addressing adequately training needs in Europe has been widely recognised. This has been the assumption of many activities of the EC, including DELTA. I am going to take this for

granted. I will just mention the last IRDAC (Industrial R&D Advisory Committee) report on skill shortages, which stated that

"increased use of technology ... requires a serious reconsideration of the use of the resources ... The basic education system can only deliver part of the required qualifications employees will need during their working life. Hence, it is evident that the pace of the technological change puts an increased responsibility on enterprises to make sure the workforce has the right qualifications and skills. Inevitably, this means a re-thinking of the human resources and training strategies in enterprises, large and small, in manufacturing or services, which should result in increased efforts for training".

Later on, in its final recommendations, the same IRDAC report concluded that

"therefore, a structural effort in distance and flexible learning is required in Europe. Traditional distance learning systems (such as those of the Open Universities in Europe) should be assisted in redirecting their actions more towards industrial environments. In addition, more technology itself should be used in the production and delivery of training materials to allow for individualised learning and to increase the efficiency of the training processes".

In principle, therefore, there is a need and a potential solution, and that means a market, but let's go back to the questions:

- Where is this market?
- Which are the market forces involved?
- What effective solutions can provide learning technologies to the identified needs?

I will try to identify some market characteristics and possible trends.

An overview of the status of the market reveals that training has been dominated by the public sector. The organisation of training in the Member States has traditionally been supported by public expenditure. There is now a reorientation towards support for private sector training supply. The responsibility for investment in training needs to be clearly allocated between the public and the private sectors. This represents a shift of perspective towards looking at training as a value-added service with a market potential in its own right. This trend is being confirmed by an increasing activity of private sector organisations which are already

investing in experiments such as EUROPACE or in the development of innovative materials based on new systems, such as CD-I or DV-I.

However, the uptake of new learning technologies is far from assured. Cost is a major inhibiting factor, especially the initial cost of production of multimedia materials, which requires powerful multimedia workstations and multi-disciplinary teams. Technology-based training is a high-demanding sector in terms of technology, which doesn't provide, for the time being, sufficient evidence of return of the investments. Telecommunication tariffs and the need for high cost delivery systems are other factors impeding uptake of the market.

Lowering the costs by more efficient means of production has been the most usual approach and this can offer a reasonable solution to the public sector or the home user. The private sector is demanding substantial improvements in the performance of the technologies. Lowering the costs per learner served is a reasonable assumption; but this is a matter of quality as well. Economies of scale have been considered, and they are potential benefits for any European action. This assumption has to be better understood, because cultural - and not only language - diversities throughout Europe are currently impeding the development of a market Europe-wide. The Internal Market, with its associated demand for new European qualifications may help to broaden the market. In any case, generally speaking, the solutions are very demanding in terms of flexibility to allow the adaptation to the very different cultures and languages.

Technologies are mature enough to convey a broad range of efficient training services. The potential of some technologies, such as satellites or multimedia, to give some examples, are far from being exploited for learning purposes. There are many competing schemes which have yet to identify clearly with a particular market segment. The issue is to define, realistically, the likely pace of innovation and market uptake of the different systems in the light of critical cost factors and their performance.

There are well-known user requirements, such as language learning or technology management, which technologies can help to meet, thus providing an important market. The requirements of small and medium enterprises (SMEs) are very demanding of flexible learning and constitute another important market sector. Corporate training needs require solutions, and we should bear in mind the need to provide new services which match the corporate human resource strategy of the companies. The services should be gradually enhanced with new technologies, an evolutionary

strategy, providing at every stage a rationale for further investments based on forecasts of the revenues expected. This is the single means to guarantee a real uptake of corporate innovation; innovation for its own sake is not a sufficient justification. The usual technology management schemes apply to the training departments of the companies. Other groups, such as people in rural areas or with special needs, will benefit from the larger scale of the market, if it becomes European-wide.

The Standards

There is a need to develop a European strategy to harmonise training provision through technologies.

The rapidly evolving technologies are deterring decision makers from more ambitious investments in training. On top of asking "what technologies are most appropriate for conveying the different training services", there is a need to identify and agree upon standards for learning technologies. The DELTA Exploratory Action addressed this issue through an action line expressly devoted to interoperability. Now, the need to base any new research on "de facto" standards, is becoming more evident; the training market is not going to define any specific standards on top of those already accepted. Nevertheless, there is still a need to enable interoperability of the different technologies used, portability of learning materials and intercommunication between networks and infrastructures for learning services.

This applies to the design and production workbenches, the access to learning resources and to their various means of delivery. The identification of methodologies and guide-lines for the various processes and their validation will be integral part of any future research. The agreement on quality standards for these processes is a key concern for any future implementation of learning services trans-European wide.

Central to the definition of functional specifications for technology-based learning are the users with their specific needs, whether the user be an individual learner at home, a training deliverer or a courseware author. Users must be involved in defining the infrastructures and services, and, therefore, the standards of the technologies and systems to be used.

- What are the standards?
- How to build the common platform?
- Which learner interfaces are to be used?
- What are the networks configurations best suited for learning purposes?

These are some of the questions which are going to be tackled during this workshop.

Effectiveness of solutions

I have pointed out the need to involve the private sector in this field, and hence to see training as a value-added service, as a market in its own right. That means that we should look at training technologies in terms of providing efficient services and allowing a return of the investments. What potential added-value will these technologies bring to the user?

Firstly flexibility, permitting the adaptation to different paces of learning, different needs and didactic strategies; secondly accessibility, enabling remote or local access to training materials and expertise whenever and wherever required by the learners, putting at their disposal the know-how and expertise wherever they exist and whenever they are needed. Finally, an adequate service infrastructure providing optimum support to the users, learners, trainers, producers, etc. This should encompass the various processes involved: information to trainers and trainees on educational resources tailored to the specific needs, their delivery, the monitoring and tutoring of the learners and facilitating the access and usage of basic tools and materials required by designers and producers.

All these solutions are to be tested in real settings, addressing real needs aiming at identifying critical factors for success from users' acceptance to the pay-back of the investments. Evaluation methodologies, therefore, will play a central role in any future action. A coherent evaluation framework should guarantee that future experiments provide more practical knowledge on how best to convey training services through the use of technology, or the quality standards to be applied, as is a usual practice in any other domain.

There are other factors which might strongly in-

fluence the feasibility of potentially effective solutions. I am referring to the regulatory issues such as copyright, tariffication or fiscal treatment. These factors should be borne in mind in any large scale testing and in any implementation scenario for future services.

R & D in Learning Technologies

The DELTA Exploratory Action represents a first step in the tackling of the above-mentioned issues. The R&D involved over 160 different organisations, publishers, PTT operators, SMEs, IT&T vendors, software producers, services providers, etc. who joined efforts to undertake an action on a European scale.

It encompassed a broad spectrum of actions, which included the development of pedagogic concepts, technologies, testing of telecommunications, standards issues and market factors. The results of the research with regard to the last two mentioned items already provide a sound basis for future work in this field. A better understanding and dissemination of the initial results will help the next phase of the research in finding successful paths to meet the requirements of the users of learning technologies and to implement services and infrastructures for flexible and distance learning.

The action envisaged will take account of the issues addressed in this workshop in order to shift the emphasis towards the concept of technologies meeting users' needs in critical market sectors, with a clear market rationale. Pilot experiments involving final users will be launched in order to validate users reactions and market acceptance of the solutions provided, with a view towards the emergence of infrastructures and services for training Europe-wide.

Presentation of the theme

"Markets for technology-based learning"

Corinne Hermant and Lieve Van Langenhove

Presentation

Several studies and surveys carried out by DELTA Exploratory Action projects have revealed both the potential and the limitations of the training market in Europe. The market for flexible and distance learning is still an immature and fragmented one. However it is undeniable that it is also a expanding with a high potential, to the extent that an annual growth rate of 30 % has been predicted.

The specific issues relating to this market were presented and discussed at the workshop during three parallel sessions:

- Small and medium enterprises (session 1A)
 - What are the specific issues of the SME market? What training scenarios are applicable to SME managers? How should the market be approached? What implementation strategies should be investigated?
- Corporate Training (session 1B)
 - What is the size of the market? What does it tell us about future requirements? Are there sectoral groupings? Are there organisational schemes to implement advanced learning technologies?
- User requirements (session 1C)
 - Are there specific requirements? Should we address the requirements for language learning and technology training in a specific manner? Should research be done on special targets? Through which methodologies?

There follows a brief overview of the discussions and the research results so far obtained by DELTA projects.

How much should be spent on advanced training in Europe?

The potential of the new ALT market will be realised not only through the existence and benefits of the technical innovation and its resulting products but once the possibilities have been disseminated. One way would be to start from global figures on training services at large. However, we do not have precise figures about training in the Member States of the European Community. Even CEDEFOP, though specialising in the provision of information on training, states that there are no comparable data. The following figures, compiled in 1989, are, therefore, only indicative

and serve as a basis for an estimation.

In France, the "Délégué à la Formation Professionnelle" gave a rough estimate of 60 billion FF spent on training services every year. Other sources gave a figure of 53 billion FF, which would be spent by national public funding (13 billion), companies (23 billion) and the regions (2.7 billion). Training of civil servants would have represented another 13.4 billion FF. Given that a significant part of this money represented the wages of the trainees, 4 billions Ecus might be a reasonable assessment of the specific training component costs.

In the United Kingdom, official sources gave figures of £18 billion which had been spent by employers and around £3 billion which had been spent by central government on Manpower Services Commission training and employment measures. Given that wages would have represented 75 % of company spending, £3.6 billion, ie around 5 billion Ecus, would have been spent on industrial and vocational training.

Given that the United Kingdom and France represent two-fifths of the European market (this is the basis of estimation in many market studies from sources such as Dataquest and IDC), an approximate European figure of 25 billion Ecus can be estimated.

If only 5% of these expenses were allocated to new technologies, 1.25 billion Ecus would be an estimate of the market in an initial phase even if these figures did not take into account the role of the individual consumer and potential voluntary training in total training figures.

Whilst assuming such a figure to be realistic, the timescale for market development has to be considered: perhaps sometime between 1992 and 1995. Such predictions are as uncertain as those concerning the micro-computer market before spreadsheets, filing systems, and word-processors were developed and commercialised.

What do the potential European users have in common?

Predicting the nature and type of users of an immature market is a research exercise yet to be undertaken. Some categories of users were highlighted during the workshop:

- the transnational companies which have a large number of people to train in a number of remote locations
- the training departments of large companies such as banks, insurance companies, building societies

- the small and medium enterprises (SMEs), in which a large proportion of the European workforce is engaged
- the Open University students
- the post-secondary pupils etc

There is a consensus on the fact that the market is strongly based on services. The keynote speaker particularly emphasized the fact that, on the user's side, multimedia products are constituent elements of a service. People are looking for a definite result. On the producer's side there is a need for more standardisation and manufacturing: the production of the service. At the interface between these two processes, there is a need to involve the consumer in the service production process. In this context, the emphasis is put on the building of common features for the development and delivery of services. It would appear to be crucial to develop common methodologies for

- designing the learning materials
- capturing the requirements
- managing the technology
- managing innovation
- managing training within companies.

The application of technology to learning is only a component of more complex systems.

This widely held view leads to the conclusion that implementation strategies are crucial to allow the recognition of users' requirements. The implementation process must build on existing matching of resources:

- private and public sectors joining their strengths for developing quality service products
- adequate organisational settings (professional training centres)
- adequate regional settings matching the skills of different professionals.

The ability of a user to invest, regularly confronted with new technological options as he/she is, remains questionable. Though the user may base his/her training service on a given multimedia stand-alone configuration, new technology settings may arise to challenge the afore made choices.

Production: what are the issues?

Both the evolution of standards and the service dimension of most commodities on the market create difficulties for developing mass products. This explains the relative disappointments of the 'classical' publishers trying to move towards standardised products.

As the keynote speaker, Mr Albertini, explained, there is a large number of producers who are not oriented towards the global market:

- research laboratories and university departments
- cooperative associations for training
- in-house training departments.

A double shift may be observed: a shift from education-oriented products to training-oriented products; a shift from the non-market to the market. In addition, other producers such as software houses, classical publishers, specialised publishers also tend to go for training products oriented towards the market.

Although there is a need to put capital to work, and a trend towards more professionalism, the market for technology-based applications is still dominated by craftwork methods. The nature of the market favours short life products, though it is expected that long life products are better performers. The value of creation is not yet well recognized. Authors have traditionally received a 'marginal revenue' from the publishers, as they were already in receipt of payments from other employers. The commercial value of some new products is still not anticipated by training companies who sell them at their 'marginal cost'. These models are no longer relevant or successful.

The impact of public policies, a point introduced in the third session of the workshop, was also discussed. Some negative effects were highlighted:

- the risk of perfectionism rather than professionalism,
- the bias to competition by a number of non-market operators.

In conclusion, the user-oriented approach and the accent put on quality insurance are coming together with an increased professionalism and the development of structured methodological tools on the producers' side. New structures for production, new market structures and new market evolutions will result from those trends.

The market for small and medium enterprises

The small and medium enterprise (SME) market has its own characteristics quite different from that of the large companies. The means for developing training actions within SMEs are less exploited. The investment in further training only accounts for 1% of the turnover, which is less than the efforts of large companies. The reasons for this are legion and related to the level of employees, type of functions, the organisation of the company, the size and budget constraints, etc. The need and demand for training, however, (even through technology-based means) is high and has specific characteristics.

SMEs need training of specific apprenticeship skills with short term effect and which is seen by the trainee as highly relevant for the work, no additional weight on the workload, increasing the adaptation to market changes and relying on external training services and tutorial assistance.

In a survey of 200 SMEs in the Pays de la Loire 63 % were interested in using multimedia for training purposes for the following reasons:

- to be trained in its own rhythm - 26.1%
- to be trained within the company - 26.1%
- to be trained without a trainer - 13.0%
- to use several supports - 21.7%
- less costly - 4.3%
- other reasons - 21.7%

Many of the skills defined in SMEs have been acquired through apprenticeship situations and are based on learning-by-doing with the practical experience underpinned at a theoretical level at regular intervals. SMEs look for immediate solutions to specific training problems. SMEs want to have a clear view both on how training can resolve the stated problems and on the concrete effect of the training effort on the enterprise. The pedagogical strategy of 'just-in-time-training' is therefore applicable to SMEs.

Given all these constraints and difficulties, an explosion of training demand from the side of the SMEs cannot be expected; neither can a demand for the use of ALT. The SMEs are not interested in the tools for their own sakes but in the benefit they offer in increasing competitiveness and flexibility on the market.

There are a number of possible scenarios to deal with the training need of SMEs:

- "compagnonage" by a large company

- individual training with tutorial assistance;
- external training through training centres;
- training at home;
- clubs of SMEs connected through telematic networks .

Different models of delivery of training to SMEs and their advantages were demonstrated and discussed during the workshop through cases of good practice of learning technology applications:

- Remote access to training resources and information databases. Few SMEs had taken-up the opportunity offered by open universities. Telematic configurations were a challenge.
- Remote discussion forums stimulating communication and group learning. An experiment between the Pays de la Loire and Aarhus had been very supportive to this kind of training model.
- The use of stand-alone multimedia applications. CAL and multimedia however need expensive devices which were not necessarily available and, worse, not well accepted by the SMEs. The lack of tutorial assistance was seen as particularly negative. The multimedia products are also often not sufficiently well adapted to the specific situation and needs of the SMEs.
- Auto-training with remote tutorial assistance. The organisation of specific tutoring at a distance or in a remote training centre must be undertaken. This implies the training of trainers familiar with SME conditions.
- External training through intermediate or interface associations within a specific region or sector. This model is preferred by SMEs due to its social and flexible character.

Two different types of intermediate organisations were seen as relevant for training in SMEs.

The first was a externally located professional training centre providing specific training services to SMEs. Besides training, an exchange of information and the tutorial guidance were crucial tasks in such an intermediate training structure. Counselling, exchange and meeting other SMEs is as important as the provision of training facilities and services. A model of interchange was presented by Carlos Braga during the workshop.

with the training tools they need, at the moment they are needed, with suggestions of tutorial models, a general advice and support service, a technical help desk, communication forum means, etc.

A second type of intermediate structure was more formal and administrative, providing SMEs with all kinds of information and liaisons with training centres and other relevant organisations. These administrative associations may be sectoral or regional. An example of an intermediate regional association can be found in the region of the Pays de la Loire (France): PLEAID (in French: Pays de la Loire et Enseignement Individualisé A Distance).

The definition of suitable training models for the SMEs is not straightforward, particularly because SMEs are not an homogeneous group united by the common denominator of size. They vary in nature, complexity, technology use, managerial styles, etc. There is a huge difference between a SME of 25 to 30 engineers and a company with 300 persons employed with a hierarchical management of, say, 10 persons.

Criteria which may play a role are:

- the technologies used within the SME
- the type of production and the kind of product commercialised by the SME
- the type of association that unites different SMEs
- the interest in training
- the existence and eventually use of multimedia means.

It is therefore important to understand the differences that exist within the SME sector in order to be able to accurately target efforts for the implementation of learning technologies. Further work on a typology of SMEs is necessary in order to provide a useful list of delivery configurations of learning technologies versus skill to be trained and the context of the training.

How do users of Advanced Learning Technologies see the future?

All DELTA surveys (DELTA Exploratory Action Projects OSIRIS, BISFACT, STARTUP, 1991) reveal the same user requirements as being important for technology-based training:

1. Product should be learner-oriented - 85%
2. Technology should be reliable

3. Technology should be user-friendly

4. Technology should be compatible with existing ALT systems

Most of the users of Advanced Learning Technologies take a very prudent position towards future use of ALT. They see the future rather as a realistic mixture of traditional media and more advanced training tools¹.

- 0% - ALT only
- 29.6% - ALT and traditional media with an emphasis, with an emphasis on ALT
- 51.8% - ALT and traditional media in equal combination
- 18.5% - ALT and traditional media with an emphasis on traditional media
- 0% - traditional media only

In Portugal for example, 59% of the companies thought that the global level of external training offered was insufficient or scarce and planned therefore to expand their professional training. 12% of the respondents possessed a satellite dish; 88% possessed a LAN and/or PCs which could be used for satellite distance education

As for the future of distance learning by satellite, interesting trends came out of the study of PRO-DELTA2. Their study on scenarios for a European satellite educational channel in Portugal showed that nearly half of the companies addressed preferred taped delayed courses presented at the workplace rather than satellite delivered training.

- Scenario 1: direct reception of courses presented inside the company (preference nr 4)
- Scenario 2: direct reception of courses presented at a professional training centre (preference nr 3)
- Scenario 3: taped delayed courses presented at a professional training centre (preference nr 2)
- Scenario 4: taped delayed courses presented inside the company (preference nr 1 by 47 %).

For the more high technology scenarios (1 & 2) a number of difficulties must still be overcome, both in the technical areas as well as in the psychological attitudes of Portuguese business (eg language barrier and weakness of the computer interface). The perfection of real-time translation would fill the void as English becomes the favoured second language.

In conclusion, markets for ALT are both dynamic and complex achieving growth through segmentation and standardisation. The research findings and workshop discussions made it clear that other factors which affect the take-up of learning technologies are the nature of demand, the quality and availability of skills, innovation and investment, rather than any specific attributes of the technologies themselves. Technological advance is of little consequence if pedagogic design is poor, training content insubstantial and the quality of service provided to customers is low. Technologies however can play a major role in increasing this quality, flexibility, and effectiveness whilst decreasing costs. The successful market integration

of ALT will only be achieved if social, human and environmental factors influence technological possibility to a far greater degree than they are currently doing so.

The keynote speech by Jean-Marie Albertini and the contributions of Carlos Braga to the "Market for small and medium enterprises", Ronnie Dallal to "Market of corporate training" and Chris Lloyd to "Market and user requirements" are set out on the following pages.

Where are the markets for technology-based learning?
**"La prise en compte des couts dans les strategies de production
des nouvelles technologies de formation"**

*Jean-Marie Albertini et Joel Bonamy, Centre National de la Recherche Scientifique
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Curriculum Vitae - Jean-Marie Albertini

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Directeur du laboratoire C.N.R.S.-IRPEACS
Président de l'ARDEMI (Association pour la Recherche-Développement de
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Depuis octobre 1975, J.M. Albertini est directeur du laboratoire propre
C.N.R.S. - IRPEACS. Ce laboratoire travaille dans le domaine de la com-
munication médiatisée. Il mène des recherches plus spécialement dans
l'introduction des nouvelles technologies de formation et sur le génie des
procédés éducatifs. Il participe notamment à des projets européens
DELTA. Il a été dans la région Rhône-Alpes l'un des promoteurs d'un contrat
Etat-Région sur la production d'outils multimédias. Ce contrat est mené par
l'ARDEMI. Il est aussi, à ce titre, membre du conseil scientifique de
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Curriculum Vitae - Joel Bonamy

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service economy, his main publications are concerned with producer
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and the role of services in the transformation of developed and developing
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Summary in English

At the moment, the market for Technology Based Training (TBT) is slowly growing and is often not truly directed towards the market. In all European countries governments have helped the start-up of the production by subventioning the diffusion of TBT in initial education. However it has not succeeded in giving rise to a mass-production on market economy basis. Recently a production on market basis has been developping for continuous and vocational training, but, for many producers, this production is only a secondary feature.

In this context, the overriding economic strategy of producers consists of avoiding taking real production cost into account. They often attempt, at best, to cover marginal costs.

Such a situation may apparently ease the diffusion of TBT but actually hinders the emergence of some productive structures. From a survey research undertaken within the framework of DELTA (start-up project), the authors analyse the strategies of producers and show that new strategies are emerging, which should not only enable real costs to be taken into account but also should develop a new competence in handling, thus reducing these costs and directing towards a true professionalization of the sector.

Speech

Le marché des Nouvelles Technologies de Formation se développe mais n'explose pas. Il commence même à entrer à peine dans l'économie marchande. Ce sont en effet les centres de recherche et souvent les centres de formation internes qui ont l'ancienneté la plus importante dans la production des multimédias. Partout les Etats ont bien très tôt tenté, par des politiques de subventions diverses, de faciliter le développement des multimédias dans la formation initiale. Toutefois nulle part ces politiques ont débouché sur une production massive et standardisée relevant principalement de l'économie marchande.

Actuellement, la production en vue du marché se développe principalement dans le domaine de la formation professionnelle permanente ou continue mais a encore souvent un caractère secondaire. Dans ce contexte, la stratégie des producteurs des N.T.F. cherche d'abord à éviter de prendre en compte le coût réel de la mise au point de leurs productions. Au mieux, leurs stratégies tentent de couvrir le coût marginal.

Une telle situation peut faciliter la pénétration des multimédias. Malheureusement, elle peut aussi freiner l'apparition de structures de production saines. Si la croissance de la production, grâce à des ventes au coût marginal, n'est pas rapide, l'instabilité de l'offre s'accroît, les effets d'apprentissage sont amoindris, des producteurs peuvent tenter de diminuer les coûts de production et les nouvelles méthodes ou outils de production ont du mal à s'implanter. Au total, c'est à terme le développement des nouvelles technologies de formation qui peut être sinon compromis du moins retardé.

Aussi, à partir des travaux et des enquêtes réalisés dans le projet START-UP¹ auquel nous participons, nous voudrions après une analyse des diverses stratégies qui permettent aux producteurs de ne pas prendre en compte le coût réel des N.T.F., examiner comment aujourd'hui apparaissent des stratégies qui tentent de les prendre en compte.

1. Les stratégies de non prise en compte des coûts réels

Elle est assez naturelle et attendue chez les producteurs qui se situent hors marché et l'on comprend assez bien que ces producteurs, lorsqu'ils se portent sur le marché, pratiquent des ventes marginales sans grand rapport avec leurs coûts réels.

On peut s'étonner, par contre, de la viabilité économique de cette non prise en compte des coûts réels par des entreprises qui vivent principalement de leurs ventes. En fait, toute une série de pratiques permettent à ces producteurs d'assurer cependant leur rentabilité globale.

1.1. Le secteur hors marché du non calcul économique à la vente marginale

Le secteur hors marché comprend deux grands types de producteurs: d'une part les institutions d'éducation et de recherche, d'autre part les centres internes de formation des entreprises (et des administrations).

1.1.1 Les premiers ont d'abord été intéressés par le développement de recherches tant techniques que pédagogiques. Leurs productions sont généralement centrées sur le "prototype innovant". Lorsque les pouvoirs publics ont développé des politiques volontaristes d'appels d'offres, ils ont souvent renforcé cette tendance. On notera toutefois que lorsque ces politiques ont voulu plutôt à travers les institutions d'éducation tenter de faire produire massivement des produits destinés à la formation initiale, ils ont surtout créé un "cheptel" d'auteurs qui aujourd'hui cherchent à proposer leurs produits à des éditeurs ou encore se contentent d'une production artisanale qui se diffuse par toute une série de canaux plus ou moins formels. En France, ces canaux mis en place dans les premières interventions de l'Etat jouent un rôle non négligeable dans la diffusion de copies en tout genre. Il existe ainsi dans l'Education nationale française des circuits occultés de didacticiels qui handicapent les productions marchandes.

1.1.2 La pratique des centres internes de formation est plus variée. Liés à de grandes entreprises et des administrations, ces centres ont tenté de

¹ Le projet START-UP est réalisé dans le cadre du programme européen DELTA. Il analyse les conditions de développement des N.T.F. en liaison avec un réseau de producteurs. Le 'Prime' de START-UP est l'O.T.E. (Observatoire des technologies pour l'éducation en Europe); l'IRPEACS y réalise les recherches et études concernant la France.

voir ce que l'on pouvait attendre des N.T.F. Ici leur attitude a été proche des centres de recherche et leur production voisine de la mise au point des prototypes. Là encore, certaines actions volontaristes ont facilité ces créations de produits innovants. Par la suite, leurs politiques se sont diversifiées. Certains centres ont continué leur dérive vers le sur mesure haut de gamme sans un contrôle du retour sur investissement. Tous les produits haut de gamme ne sont certes pas anti économiques. Les simulateurs pour formation des agents des centrales nucléaires ou des pilotes d'avion ont une justification économique évidente. Toutefois la manière dont sont gérés et financés les centres internes de formation peut inciter certains d'entre eux à occulter le calcul économique. Les centres internes des firmes françaises, qui bénéficient de l'aide de l'Etat à la formation continuée et permanente et qui fonctionnent souvent dans le cadre du budget de formation, sont ainsi moins enclins à prendre en compte ses coûts réels que les centres internes britanniques.

1.1.3 Dans bien des cas les productions hors marché font souvent l'objet de "valorisation" grâce à des ventes marginales. Ces ventes qui sont aussi pratiquées par des organismes de mutualisation de la production, facilitent pour une part les stratégies des producteurs directement liés vers le marché.

1.2. Le secteur marchand à la recherche d'échappatoire

Contrairement aux producteurs hors marché, il y a bien, chez la quasi-totalité des producteurs de ce secteur, un véritable calcul économique. Il a pour fonction d'assurer la rentabilité de l'entreprise sans qu'il y ait couverture des coûts réels des produits proprement dits.

1.2.1 La stratégie du camouflage des coûts réels

Elle est principalement pratiquée par les éditeurs classiques et reproduit les méthodes utilisées dans la publication des manuels scolaires. Les productions multimédias (les éditeurs produisent en fait essentiellement des didacticiels) sont réalisées par des personnes (souvent agents de l'Etat, de collectivité locale ou d'institution de formation) dont le temps de travail n'est pas réellement compté dans le coût du produit. La rémunération des auteurs par des droits n'est qu'un supplément aléatoire au revenu principal. Ayant éliminé une partie non négligeable du coût du didacticiel, les éditeurs vont prendre en charge essentiellement la médiatisation finale, la reproduction, le conditionnement, la commercialisation et la mainten-

ance. Si, de surcroît, le producteur reçoit une aide publique pour en abaisser le prix de vente aux établissements, la rentabilité de sa production n'en sera théoriquement que meilleure.

Malheureusement, aujourd'hui les N.T.F. (didacticiels ou autres) peuvent de moins en moins être produits comme des livres. Il faut constituer des équipes, des groupes projets représentant des compétences diverses. Le modèle de leur production s'éloigne de celui de l'auteur en mal d'édition pour se rapprocher de celui de l'audiovisuel ou plus exactement de la production cinématographique.

Le décollage souvent décevant des marchés de la formation initiale et l'absence de production massive de produits simples auraient pu justifier le maintien des pratiques d'édition, tandis que le marché de la formation professionnelle qui se développe le permet moins. Cette situation a créé un effet de ciseau dont les éditeurs classiques ont été les principales victimes. Ils se sont alors soit cantonnés dans une attitude attentiste et avec une présence presque symbolique tentant de tirer le meilleur parti possible de leur stratégie traditionnelle, soit reconvertis en éditeurs spécialisés ce qui les rapproche des autres producteurs commerciaux.

Il peut être intéressant de noter ici qu'aujourd'hui en Europe la firme qui tente le plus systématiquement de se positionner sur le marché de la formation initiale n'est pas un éditeur mais un producteur de jouets éducatifs. Nous aurons l'occasion de reparler plus loin de cette firme.

1.2.2 De la stratégie service compris à la stratégie produit compris.

Certes les NTF se présentent sous la forme de produits (programmes AEO, modules multimédias, programmes de vidéo interactive, bandes vidéo...). Ce sont cependant des produits assez particuliers puisqu'ils ne sont que des auxiliaires d'activités de service: l'éducation et la formation.

La formation et l'éducation ne sont pas les seuls services où sont de plus en plus incorporés des "produits" (l'avion dans les services de transport aérien, les distributeurs de crédit dans les services bancaires, les appareils de surveillance et de réanimation dans les services hospitaliers, ... sont là pour en témoigner).

Les éléments matériels d'un service ont pour objectif d'en diminuer le coût ou d'en accroître l'efficacité. Cependant le produit pris isolément ne peut changer la nature du service.

Qu'il utilise ou non des biens matériels pour être réalisé, un service demeure un bien immatériel, on pourrait dire un acte qui n'existe qu'au moment de son utilisation (de sa consommation). Le produit qui lui est incorporé pris isolément du service ne peut suffire à caractériser le service. Dans la restauration ce n'est pas seulement, le plat servi mais la nature et les conditions de sa mise à la disposition du consommateur qui caractérisent le service. Il en est de même dans la formation à distance grâce à des didacticiels.

Cette situation a d'importantes conséquences. Contrairement à un produit industriel ordinaire, il est difficile de déterminer, en fonction de l'état des techniques, l'usage normal qui peut être fait du produit d'un service. En effet, le service est d'abord un effet sur une organisation et une personne qui ne peut être obtenu sans la participation active (au minimum consentante) de cette organisation ou de cette personne. Contrairement au bien, dans le service le consommateur (le bénéficiaire) remonte dans le processus de production et y est étroitement associé (on parle à ce propos d'un phénomène de servuction)

Certains aspects des NTF relèvent d'une démarche qualité semblable à celle applicable dans l'industrie. Toutefois par bien de leurs aspects, ils ne peuvent être jugés efficaces que par rapport aux services auxquels ils doivent être intégrés et donc à la qualité de la servuction qu'ils permettront. Or, plus un service est standardisé ou manufacturé plus l'association de ses bénéficiaires à sa production est importante. Avec les NTF l'association des formés à l'acte d'apprendre doit devenir plus étroite. Les NTF entraînent aussi un accroissement important du travail individuel et doivent pouvoir s'intégrer dans des attentes et des comportements multiples.

Cette situation est dans la formation d'autant plus complexe que le multimédia ne touche le bénéficiaire final qu'à travers des intermédiaires, des prescripteurs qui en déterminent les conditions d'utilisation. Ces consommateurs intermédiaires deviennent à leur tour des éléments du processus de production du service. Ces "prescripteurs" sont dans certains pays comme la France des éléments déterminants et le "marché de l'éducation" y est d'abord un marché des prescripteurs, et non un marché où les consommateurs finaux seraient les principaux acteurs comme dans

d'autres pays. l'efficacité d'un produit multimédia ne peut être jugée ici qu'en fonction des objectifs poursuivis et, une fois de plus, ces objectifs peuvent être multiples et très différenciés, y compris à l'intérieur d'une même institution.

Il est donc compréhensible que ce soient les SSII et les sociétés de formation qui ont très vite pu trouver une stratégie adéquate assurant leur rentabilité sans couvrir le coût réel du "produit" lui-même.

Elles ont moins vendu un produit que des services, ce qui fait partie de leur métier traditionnel. L'adoption du modèle des sociétés de services par les éditeurs spécialisés a, en fait, de son côté transformé la nature du métier d'édition.

L'enquête réalisée dans le cadre de START-UP, auprès de 220 producteurs français, montre que la commercialisation, la reproduction et le conditionnement des produits sont ainsi nettement moins pris en compte que chez les SSII que chez les éditeurs. Par contre, une proportion plus importante des SSII met l'accent sur les audits (54%, contre 38% chez les éditeurs), le développement d'outils (68% contre 38%), la conception (67% contre 46%) et la réalisation (70% contre 54%).

Les SSII s'éloignent ainsi d'une stratégie "produit" pour se rapprocher d'une production de services en amont de la formation.

Cette stratégie de vente de services est encore plus présente chez les sociétés de formation. Toutefois, elle y est moins liée à la mise au point des produits qu'à la formation elle-même. Pour une part sans doute non négligeable, les produits réalisés sont intégrés dans leur propre activité de formation et ne sont pas destinés à la vente directe (78% des sociétés de formation ont des activités de conception et de formation de formateurs; 68% des activités de formation directe).

Le risque est alors une production sur mesure (qui est souvent haut de gamme mais pas forcément, c'est plutôt le service joint que le produit qui l'est). Toutefois comme dans le cas des producteurs hors marché, les produits réalisés, rentabilisés sur leur marché principal grâce à des ventes de services joints, peuvent faire l'objet d'une vente secondaire sur étagère à un prix ne tenant compte que du coût marginal. Nous verrons par la suite

En %	Audit, conseil									
CATEGORIE DE PRODUCTEURS		Developpements d'outils de creation								
			Conception (cahier des charges, maquettage...)							
				Realisation (médiation finale, master)						
					Reproduction, conditionnement (package)					
						Maintenance				
							Commercialisation, distribution			
								Formation de formateurs		
									Formation directe	
										N =
Editeurs	38	38	46	54	85	69	92	31	8	13
SSI	54	63	67	70	41	67	59	28	28	46
Sociétés de service en formation	42	30	78	40	16	34	46	78	62	50
Centres de formation interne	40	10	70	60	50	60	50	70	60	10
Organisme publics de formation	33	33	83	60	43	50	43	53	43	30
SFC Université	28	17	67	33	11	11	6	61	56	18
Centres de recherche	28	22	75	44	25	25	19	41	22	32
TOTAL	39	36	72	51	34	44	44	53	42	218

que le développement de cette pratique peut à terme donner lieu à une stratégie assurant une meilleure couverture du coût réel.

La non couverture des coûts réels du produit proprement dit est renforcée quand certaines SSII (auxquelles on peut assimiler les constructeurs de matériels informatique) cherchent à fidéliser leur clientèle sur un marché dont elles envisagent le développement¹2. Elles risquent alors de concurrencer dangereusement les sociétés de formation et inciter ces dernières à se spécialiser un peu plus dans les services de haut niveau (audit et conseil). Il y a alors report d'une partie du coût proprement dit sur le client. Ce report n'est cependant pas sans résultats sur l'efficacité du produit final car il entraîne un haut degré de servuction (association étroite du bénéficiaire du service et du processus de production du service). Parallèlement, dans ces sociétés plus du tiers de la production est utilisé dans leurs propres activités de formation et ne sont pas destinées au départ à être vendues. on peut donc penser que la diffusion externe est en partie une vente marginale.

1.2.3 La stratégie de l'homme ou de la firme orchestre

Il existe encore peu de firmes importantes véritablement spécialisées dans les N.T.F. La majorité des entreprises ne voient dans les N.T.F. qu'une activité secondaire. Cette situation commence à se modifier, nous en reparlerons dans la seconde partie. Toutefois, pour l'essentiel, le nombre de personnes engagées, même dans une firme de taille respectable, dans la production des N.T.F. demeure réduit. Dans la plupart des cas les firmes spécialisées sont de petite, voire de très petite taille. Il s'agit souvent de productions réalisées par un innovateur exploitant la veine de son idée première.

Qu'il s'agisse de la petite entreprise (moins de dix salariés) ou d'une petite équipe au sein d'une entreprise de taille respectable, la division interne du travail est souvent embryonnaire sinon nulle. La polyvalence des fonctions est la règle. Dans certains cas, la même personne assure au cours de l'avancement du projet les fonctions d'auteur, de concepteur, de "designer", de développeur, d'éditeur, de commercial. L'entreprise à personnel unique n'est d'ailleurs pas rare, elle est même

une situation commune en Norvège, ou au Danemark (pays où il existe cependant un constructeur de jouets éducatifs qui développe dans la politique des N.T.F. une véritable politique industrielle). En France, on a pu mettre en évidence la prédominance des entreprises de moins de six salariés et dans les entreprises plus importantes les équipes de moins de six personnes sont aussi les plus nombreuses.

Cette stratégie de l'homme ou de la firme orchestre a un avantage dans un marché naissant, elle diminue les frais de structure par un engagement personnel très contraignant. Nous sommes proches de la situation de l'entreprise artisanale ou de l'exploitation agricole familiale qui ne calcule pas le véritable coût du travail. Malheureusement, cela peut empêcher l'implantation de méthodes d'organisation plus conformes à la nature même des N.T.F.

Bien entendu, il y a aujourd'hui une tendance de plus en plus forte à recourir au partenariat et à la sous-traitance. Même lorsqu'ils se spécialisent, dans bien des cas les producteurs hésitent cependant à externaliser certaines activités. En dehors des éditeurs qui ont une stratégie "produits" ce sont plutôt les producteurs du secteur hors marché et notamment les centres internes de formation, qui ont tendance à externaliser le plus certaines activités. Ils deviennent ainsi un marché non négligeable pour les SSII et les sociétés de formation.

Au total, cette situation est caractéristique d'un marché naissant qui en est encore à un stage préprofessionnel.

2. Les stratégies de prise en compte des coûts réels

Les stratégies que nous venons de décrire ne doivent cependant pas occulter les évolutions qui peuvent permettre une vraie prise en compte des coûts réels et s'accompagner d'une professionnalisation du secteur.

Ce sont des éléments de stratégie qui privilégient soit l'interaction entre les producteurs (sous-traitance et filières de production); soit la maîtrise des coûts économiques de production; soit la rationalisation du processus de production et la maîtrise

¹ On notera que certaines sociétés audiovisuelles qui produisent du film d'entreprise ont elles aussi dans le domaine des multimédias une stratégie de fidélisation de leur clientèle mais elles cherchent aussi à relancer à travers les N.T.F. l'audiovisuel de formation très concurrencées dernières années par le film d'entreprise.

du rapport à l'utilisateur. Ces éléments ne sauraient définir clairement un ou plusieurs modèles et ne prennent sens qu'en se départissant des pratiques les plus courantes. Ce ne sont pas seulement des stratégies micro-économiques (que l'on pourrait ramener à des cas monographiques), elles ont un impact méso-économique de structuration de l'offre du secteur et se retrouvent dans les pays européens soit dans une phase avancée soit dans leurs prémisses.

2.1. Du calcul des coûts réels à la fertilisation croisée

Les pratiques actuelles des entreprises, comme le soulignent de nombreux interviews en Europe, montre que les nécessités économiques font place à des pratiques de performance mesurée.

En particulier les producteurs commerciaux de didacticiels en Grande-Bretagne ont une vision très pragmatique des coûts engagés. Ils sont d'ailleurs presque les seuls à fournir une évaluation qui reste approximative et cependant réaliste (car confirmée à travers les différentes interviews), des ratios des temps d'élaboration pour une heure de didacticiel. Ces ratios s'établissent dans la fourchette de 400/1 à 175/1. Le haut de la fourchette situe le coût lié à l'investissement initial et la recherche de nouvelles solutions; la fourchette basse s'applique à la production de modules dont la réalisation est une adaptation de solution déjà expérimentées.

Ni dans un cas ni dans l'autre, le marché ne permet de rentabiliser totalement les investissements et les coûts de fonctionnement engagés par un producteur assurant l'ensemble des fonctions nécessaires à la réalisation et à la diffusion du produit. L'équilibre est cependant trouvé soit en complétant le financement du sur-mesure pour des créneaux précis par une diffusion élargie du produit à des cas génériques; soit en adaptant des modules "prêts à porter" à des cas génériques sur des marchés spécifiques comme le secteur financier, la formation à l'informatique...

Il faut insister ici sur le fait que les projets sur lesquels se rentabilisent ces produits ne sont pas des projets à court-terme. Plusieurs exemples en Europe montrent que ces projets s'établissent sur plusieurs années (cas extrême, une firme danoise estime à 10 ans le cycle de vie de ses produits). L'investissement initial, la fidélité d'une clientèle

ne se rentabilisent pas dans une politique à court terme. La stratégie de maîtrise du coût économique semble bien disqualifier les stratégies des producteurs cherchant à rentabiliser à court-terme¹, ou sur un projet unique.

Cette stratégie du coût économique amène à nouveau à s'interroger sur les variables discriminantes des catégories de producteurs. Les deux secteurs se distinguent clairement. Le hors-marché, abrité par les politiques nationales, se révèle incapable de promouvoir une production "sur contrat" en tenant compte de l'ensemble des coûts engagés par sa production. Le voile pudique des subventions recouvre de moins en moins les absences de choix, de spécialisation et en définitive d'efficacité. Mais des exemples en Europe montrent que ce n'est pas une fatalité. Ainsi une firme privée au Danemark a su rentabiliser, depuis plusieurs années, une intervention sur le marché de la formation initiale dans plusieurs pays européens et nord-américains.

La distinction entre les deux secteurs recouvre de moins en moins celle entre produits standards et produits non-standards. Le succès repose largement sur une rentabilisation croisée du sur-mesure et du générique. Ce serait même la capacité de passer de l'un à l'autre (fertilisation croisée) qui expliquerait le succès tant des producteurs de "produits vendus sur étagère" qui ne négligent pas l'adaptation à la demande, que de grands producteurs de sur-mesure adaptant leurs produits sophistiqués aux cas génériques.

La stratégie de maîtrise du coût économique montre la force de développement d'un marché qui a su faire la preuve de son efficacité. Le décollage du marché NTF pour la formation professionnelle dans les entreprises s'explique largement dans tous les pays européens par l'effet conjugué de l'avantage pour l'utilisateur d'une formation démultipliable et décentralisée et pour le producteur de l'identification de "niches" de développement qui ne se limitent pas au client unique ou particulier.

Cette stratégie de vérité des coûts qui semble l'emporter en Europe soulèvera les problèmes d'exclusion du marché de plusieurs types de demandeurs potentiels: l'éducation initiale, le grand public, et les PME. Mais leur accès au marché et la solvabilité de leur demande potentielle relèvent-ils des producteurs ou d'une adaptation en pro-

¹ Plusieurs éditeurs traditionnels ont exprimés qu'ils attendaient un retour sur investissement en un an.

fondeur des règles du jeu de l'éducation, de la dépense des ménages en matériel éducatif, de l'investissement en formation des PME?

2.2. Des pratiques de sous-traitance aux filières de production

2.2.1 Les pratiques de sous-traitance renforcent (comme nous l'avons vu plus haut) les spécialisations des producteurs. Ceci est particulièrement vrai pour les sous-traitances de spécialité. Les entreprises délèguent à des producteurs spécialisés des éléments du processus qui relèvent de domaines techniques comme le développement, la duplication, la réalisation vidéo...

Mais cette pratique de la sous-traitance peut relever aussi d'une stratégie délibérée du report des éléments à risque sur les partenaires extérieurs. De nombreux producteurs ont perçu l'intérêt d'une présence sur ce marché des NTF, souvent à titre secondaire, mais ne veulent pas s'engager dans les aspects du processus de production qui ne relèvent pas directement de leur métier et où ni les technologies, ni les méthodologies ne sont encore stabilisées ou ne font l'objet d'une norme ou d'un consensus.

Les pratiques courantes de sous-traitance révèlent l'existence d'une structure d'offre partiellement hiérarchisée mais qui, dans un secteur naissant, sont largement fragilisantes. Les interactions que manifestent ces sous-traitances ne favorisent pas la professionnalisation du secteur:

- les relations entre éditeurs et auteurs s'inspirent du modèle de production de l'ouvrage et maintiennent la confusion entre l'expertise du domaine et le processus de design,
- l'état fragile du milieu ne va dans le sens de reconnaissance de technologie ou de méthode et maintient les producteurs à la traîne d'une évolution technologique qui vient d'ailleurs;
- l'innovation tend à rester confinée aux centres de recherche, sans diffusion organisée auprès des autres producteurs.

Dans ces conditions, on ne s'étonnera pas que les "success-stories" soient le fait de grandes entreprises qui ont su assurer leur développement en renforçant leur propre auto-suffisance.

2.2.2. Des éléments d'une autre stratégie semblent cependant émerger. Ils vont dans le sens d'un renforcement des composantes de l'offre en favorisant une autre combinatoire de l'offre. On peut en percevoir la faisabilité à partir de quelques

exemples récents.

Le rapprochement d'un grand centre de formation interne, d'un producteur-diffuseur d'EAO, et d'un éditeur spécialisé représente en France un pôle de développement important. Nous pouvons le désigner comme une structure en grappe, coordonnée avec participations multiples.

Il s'agit en effet d'une structure qui privilégie l'association de producteurs apportant chacun une spécialisation autour d'un métier (conseil, conception, développement, édition, diffusion, formation, maintenance). Les rôles sont précisés même si la présence de plusieurs producteurs sur une même fonction n'interdit pas la concurrence.

La complémentarité avec d'autres structures à réseau peut jouer pleinement. L'éditeur s'appuyant sur une structure de développement forte, les producteurs de sur-mesure trouvant là la possibilité d'aller vers le générique donc vers l'éditable et le diffusable. La structure en grappe favorise un développement de l'ensemble à la fois à travers une structure financière solide, des moyens de production et de développement assurés, des efforts communs pour renforcer les tentatives d'imposition de standards sur le marché.

Cet exemple montre l'importance de l'innovation d'organisation du marché et de la production dont il existe d'autres exemples dans les pays européens. Mais cette innovation ne peut se faire hors du calcul économique.

LES ELEMENTS DE STRATEGIE PRECEDENTS CONVERGENT (EN PARTIE DU MOINS) SUR LA NOTION DE RATIONALISATION DE LA PRODUCTION, ELEMENT CENTRAL DE LA SPECIALISATION DES ACTEURS DANS LES FILIERES DE PRODUCTION, ET ELEMENT SOUS-JACENT D'UNE RECHERCHE DE DEVELOPPEMENT AU "COUT REEL".

Deux aspects de cette rationalisation de la production se conjuguent et renforcent par là la similitude avec l'évolution du secteur des services. Il s'agit d'une part de la rationalisation technique et managériale des projets et d'autre part de la professionnalisation des rapports aux usagers.

Sur le premier aspect, toutes les observations dans les pays européens convergent pour montrer que le temps de la production artisanale est révolu. Même dans les très petites entreprises où tout le monde faisait tout, une division du travail plus stricte s'impose, ne serait-ce que par la complexité croissante des technologies mises en oeuvre dans les multimédias. Dans les petites entreprises, la division du travail s'impose au

moins dans une division externe avec les entreprises sous-traitantes ou partenaires.

Dans les entreprises de taille plus importante, cette division du travail s'impose et distingue analyse amont, décision, conception, développement, diffusion, maintenance, mise à jour. Des différences notables subsistent dans l'organisation du passage d'une phase à l'autre et donc dans le partage des responsabilités entre concepteurs et développeurs, experts du domaine et experts du design... Mais s'impose un modèle de management par projet qui est conduit par un profil nouveau d'animateur-manager et qui se traduit invariablement par le renforcement des spécifications du cahier des charges (Cf infra).

Le renforcement de la hiérarchie est signalé dans tous les pays. Elle prend les deux aspects:

- de hiérarchie interne (qui était restée peu marquée dans ces entreprises nouvelles) qui met le plus souvent au premier plan un leader ou un groupe projet où le premier rôle est joué par les experts du domaine ou du design aux dépens des développeurs;
- et de hiérarchie externe par une division plus nette du travail avec les sous-traitants. Les comportements en ce domaine divergent largement. Certaines firmes privilégient le travail en interne qu'elles contrôlent mieux et ne délèguent à l'extérieur que des tâches périphériques à leur métier (comme la duplication); d'autres, au contraire, privilégient le partenariat comme moyen pour rendre plus transparent les méthodes et leur respect, les coûts et en définitive la maîtrise des performances.

Deuxième aspect: Un élément central de cette rationalisation est le cahier des charges. Il est le lieu de convergence de la rationalisation de la production et de la professionnalisation du rapport à l'utilisateur. Il témoigne d'une démarche qui embrasse à la fois la relation à l'utilisateur par la spécification de ses attentes et l'engagement de résultat des producteurs.

Il s'agit d'une stratégie de professionnalisation du rapport à l'utilisateur qui prend de nombreuses formes en Europe. Elles ont en commun la particularité de faire remonter l'utilisateur très en amont dans le processus de production et d'engager la responsabilité de l'entreprise très en aval dans le suivi de la mise en oeuvre de ses produits. Quelques exemples peuvent être cités:

- Au Danemark, un producteur a mis en

place des équipes de conception faisant largement place à des groupes tests d'utilisateurs potentiels ainsi qu'une politique de production et de diffusion sur plusieurs marchés nationaux tenant compte des spécificités des curriculum, des attentes des enseignants, des priorités des autorités de l'éducation.

- En Suède, un producteur met l'accent sur l'organisation de la production en fonction de la qualité perçue du service fourni. La participation active du client et particulièrement des personnels des services du client qui seront destinataires du produit est mobilisée dans chacune des phases de production.
- En Suisse, des producteurs mettent au point des produits particulièrement innovants dans une optique "user-oriented": la proximité au client est la variable clé où se trouve soit la localisation de l'entreprise au noeud d'un réseau d'entreprises du secteur client, soit dans la proximité de cultures de références techniques des ingénieurs-concepteurs et des utilisateurs-ingénieurs. Dans un cas l'orientation va dans le sens de la réalisation de produits très sophistiqués technologiquement et pédagogiquement mais supportés par des pratiques structurées d'évaluation dans leur adaptation aux besoins de formation; dans l'autre cas, l'orientation va au contraire vers des solutions d'interaction homme/machine limitées pour mieux s'adapter aux situations d'autoformation du milieu dans lequel sont diffusés les produits.
- Aux Pays-Bas, en Grande-Bretagne, en France, plusieurs exemples montrent la mise en oeuvre d'outils méthodologiques structurés qui découpent les phases de production, leur résultat attendu et leur validation par le client.

Derrière ces pratiques, quelques éléments se combinent le plus souvent:

- l'accent porté sur les études amont et leur lien avec l'assurance-qualité que garantit le producteur. Cette démarche tend à une professionnalisation par l'adéquation du résultat au besoin.
- l'accent porté sur l'image-produit de l'entreprise: cette recherche de plus grande homogénéité des produits s'accompagne nécessairement d'une attention accrue au suivi du produit dans son

cycle de vie (mises à jour, maintenance ...). Elle tend à une professionnalisation par la promotion d'outils méthodologiques structurés.

Conclusion

Aujourd'hui, l'ensemble des producteurs commencent donc à sortir de la phase de pré-professionnalisation dans laquelle ils se trouvent. Le marché commence à se structurer et les entreprises ont déjà de nouvelles modalités de fonc-

tionnement. Il est d'ailleurs très intéressant de noter, comme l'a montré l'enquête menée dans le cadre de Start-Up, qu'il y a une liaison très étroite entre l'évolution du marché, sa structuration interne et l'organisation de la production. Cela laisse augurer de profondes modifications dans la structure actuelle des producteurs. Il serait intéressant de les suivre pour comprendre comment évoluera ce marché.

Small and medium enterprises

Carlos Braga, Fundetec

Curriculum Vitae

Carlos Braga (born in 1948) graduated as a Mechanical Engineer, specialised in Thermodynamics and Automation at the Technical University in Lisbon and attended several courses on Management, Organisational Systems, Data Processing Methods and Systems and Human Resources Management.

He has had a career as an engineer and as a manager at the Portuguese Postal and Telecommunications Company (CTT) in the fields of Transports, Physical Distribution, Postal Systems, Organisation and Information Systems. Since 1984, he has been Director in the Company. Since 1986, he has been Consultant Assistant to the Direction of INESC (Research Institute in the fields of Information Technologies) for Educational and Training area and General Coordinator of FUNDETEC (non-profit association of 26 companies for educational funding and professional training in the fields of Energy, Telecommunications, Electronics and Information Technologies). Under these conditions he managed and conceived several programmes and projects at national or international level in different fields.

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Abstract

Key discussion areas:

- 1) The specificities of the SME's market;
- 2) Training scenarios for SME managers;
- 3) Ways to approach the SME market - Implementation Strategies

1) Specificities of the SME's market

Small and medium enterprises are growing in importance in key sectors of the European economy. This growth is based on the new forms of production and on new organisational principles. This growth has created new training needs. Underlying these changes is the rapid development of information and telecommunications technology and its associated software.

Small and medium enterprises account for approximately 80% of the European GDP. Unfortunately it is often the SMEs that are least able to fulfil their training needs. Their importance in the European economy is growing. There are various reasons for this:

- The increasing use of flexible manufacturing in comparatively small production units utilising Computer Integrated Manufacturing techniques, makes the SME a potentially more competitive production unit than the large companies.
- Changes in the pattern of consumer demand in western economies to quality items of comparative rarity necessitate production units flexible enough to produce in small batches and to switch production runs between different products to meet the fluctuating and idiosyncratic demand schedules.

Technological innovation is therefore transforming the capital requirements, organisational structures and human resource requirements of many SMEs¹.

The above is the ideal of the modern efficient and productive SME. However the majority of SMEs throughout Europe does not fit the above profile.

SMEs are not a homogeneous group united by the common denominator of size. They vary in nature, complexity, structure, technology use, managerial styles, etc. It is important to clearly understand the differences that exist within the SME sector in order to be able to accurately target efforts for the implementation of ALTs. SMEs with different natures will:

- have different training needs
- use different technologies and at different levels.

Two broad types of SMEs can be distinguished:

- the traditional family style SME that usually functions in traditional sectors and
- the high technology SME.

This differentiation is still too simplistic:

- What other types of SMEs can be defined?
- How do their training needs vary?

SMEs also have a very specific nature that distinguishes them from the larger companies.

Whilst large companies usually have professional training departments that more or less deal with their training needs, SMEs usually don't have such departments.

"Many of the skills defined in SMEs have been acquired through apprenticeship situations and are based on learning-by-doing, with the practical experience underpinned at a theoretical level at regular intervals" (Cooley, "What Industrial SMEs in Europe need from Advanced Learning Technology", p.3).

A SME manager does not usually have the resources to delegate managerial functions, and so must do a little bit of everything. This means that the SME manager can't focus his/her time on a specific issue such as for example professional training. As a result, training needs, training methodologies and learning technologies come behind production and financial issues on the managers priority list.

1 DELTA Impact assessment and forecasts, Vol II p.21, CEC document DE1715, May 1990

SMEs spend less of their resources on training than the large companies. How can this trend be reversed?

Is the average education level of those working in SMEs lower than those working in large companies? If so, this might have an effect on the use of Advanced Learning Technologies by SMEs, especially if the ability to use these technologies depends on the level of education of the user. Cooley characterises the European SME workforce as being "highly skilled, committed and flexible" (p.2)

2) Possible scenarios for the use of ALTs by SMEs

- At Home:
 - › Is it realistic to consider the home as a possible environment to train SME workers?
 - › What are the benefits for SMEs of their employees receiving professional training in the home environment? Possible benefit: Employees would not use working hours for professional training. This factor is important to SMEs due to the fact that the lower the number of staff members the more costly is their absence.
- At work:
 - › SMEs often rely on informal sources of information and knowledge. This can be referred to as a "grapevine" form of learning. New technologies should be harnessed in such a way as to emulate SME training traditions, i.e. a form of electronic "grapevine" capable of providing "just-in-time" training, expertise or counselling as and when it is needed. (DELTA Impact Assessment and Forecasts: Volume II, p.23)
- In Professional Training Centres:
 - › SMEs don't have the resources to set up professional training programmes. Professional training centres based on Advanced Learning Technologies could be set up especially for use by SMEs. These centres could provide shared training facilities for SMEs.
- Associations: What role should industrial, sectoral and regional associations play in the professional training of SMEs?
- Professional training via satellite: which, if any, is the most feasible scenario for

SMEs, for the reception of professional training courses at a distance?

- › Direct reception of courses, presented inside the company;
- › Direct reception of courses, presented at a professional training centre;
- › Taped delayed courses, presented inside the company;
- › Taped delayed courses, presented at a professional training centre.
- Regionalisation:
 - › A possible training scenario refers to those SMEs that are located in the rural areas where there is a lack of professional training services. The small and medium companies in the regional areas could receive professional training by means of the distance education concept transmitted from centralised vocational training centres. They could receive the training courses in local reception sites or in their factories.

3) Implementation Strategies

Cost is a major inhibiting factor in the introduction of Advanced Learning Technologies in SMEs. This is especially the case in the years when the new technologies arrive on the market. One possibility is to concentrate marketing efforts on large companies, while the price is still too prohibitive for the SME market. The large companies will act as trend setters for the SMEs in the use of Advanced Learning Technologies. In this way SMEs will be aware of the learning technologies by the time the demand/supply curve makes the price accessible to them.

SMEs must be made aware of the potential of the Advanced Learning Technologies. How can this awareness be created? What awareness raising strategies can be implemented?

One of the primary necessities for the successful implementation of Advanced Learning Technologies is that of managerial support. Unless there is a positive attitude toward Advanced Learning Technologies beginning at the very top, their overall impact will be limited. This is especially the case for the SMEs, because in SMEs the manager makes all the important decisions. Thus marketing efforts for the implementation of ALTs must be focused on the decision makers within the SMEs.

It is crucial to know the training needs of SMEs in order to be able to apply the correct learning technologies to best serve their requirements.

Thus "needs analysis surveys" must be carried out.

An important question that must be faced with respect to the implementation of ALTs within SMEs is whether the professional training courses should be standardised or be adapted to the needs of each individual SME.

Language poses a barrier to the successful implementation of ALTs. It is necessary to develop strategies to overcome this problem such as, for example, simultaneous translation, dubbing, subtitles and the use of a support tutor.

Corporate training

Ronnie Dallal, BIS Mackintosh

Curriculum Vitae

Ronnie Dallal graduated from King's College, London, with First Class Honours degree in Electronic and Electrical Engineering in 1977. He obtained his Masters degree in Computing Science at Imperial College for Science and Technology, London in 1978.

On completion of his second degree, Ronnie joined Ferranti Computer Systems, Wythenshawe Division, where he worked on several projects with responsibility for software development and man management.

In 1983, he joined Crosfield Electronics Ltd, where he took on the responsibility of managing several large projects, development and management of software and hardware engineering teams.

In 1987, Ronnie was sponsored by Crosfield Electronics to attend an MBA degree course, on a part time basis, at Cranfield School of Management, Bedford. On successful completion of the course he joined the Corporate Business Planning and Market Research Department, where he was responsible for defining a marketing strategy for new business venture and development of industry econometric and pricing models.

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Abstract

The open learning process encompasses any learning that is learner centred in terms of time, place and pace of learning: it demands active participation by the learner, but nevertheless offers active support to the learner. The necessary guidance and counselling may be given by telephone or face to face. The most usual forms of open learning involves self study using workbooks; correspondence; audio and video delivery systems.

Flexible and Distance Learning (FDL) integrates the open learning process with advances in technology to provide more effective and flexible delivery systems. It does that by matching the newly available technologies (eg PCs, Graphic and Multi Media stations) with training course requirements. Majority of these technologies are readily available in medium to large organisations.

Materials and support for the learner can be purchased "off the shelf", adapted or developed for individual company needs. FDL may stand alone (eg a set of computer based training material) or may be part of an integrated package of training which also includes more traditional elements (eg classroom).

1) Benefits of Flexible and Distance Learning

Undoubtedly the most important benefits of adopting FDL process within an organisation is its cost effectiveness in terms of provision of company wide training. Existing users have benefited from reduction in work disruptions, the single largest cost component which accounts for as much as 85% of the total training costs. Other financial savings include premises, administration, tutors and travel expenses cost reductions.

1. Reduction in training time

IBM has cut training time for its salespeople from 12 to 9 months.

By adopting interactive video and Computer-based training (CBT), Lloyd's Bank has reduced 66 hours of audio training to 28 hours; a reduction factor of over 55%.

2. Training carried out outside working time

A supermarket, with the aid of a government grant, has introduced an FDL programme for its supervisory staff. All of the training was undertaken outside working hours.

3. Training can be done on the job

Employers are making use of short training sequences, delivered by FDL technology, to help staff carry out rarely used operations.

Availability of staff to deal with emergency situations, whilst they are undertaking a training course.

Travel cost reductions. A German company has managed to save ECU 340,000 on travel expenses.

4. Increased information retention

A car manufacturer developed a combined CBT and videodisc programme on a complex mechanical subject. When this course was tested by a management trainee, she was able to retain about 85% of the basic information.

5. Staff commitment and motivation.

The use of FDL training courses demands high motivation and dedication by trainees. As a by-product, companies are able to test and assess the level of staff commitment and motivation.

6. Other benefits

Reductions in the cost of training premises and tutors. However, these cost savings are offset by FDL equipment costs.

Higher throughput of trainees.

The single most important benefit to the employees was the flexibility of the learning process. Other benefits cited by employees are:

- Training courses can be customised, to a certain degree, to suit individual needs;
- The pace, time and place of the training period can be altered to suit the life style of the individual;
- Low incremental costs means training can be made available to a wider audience;
- FDL is perceived to provide continuous training facilities. This is used by several organisations for retraining purposes.
- Absence of peer pressure and group dynamics. Consequently, trainees are encouraged to make the best use of training facilities and progress at their own pace;
- Trainees reacted positively to the 'auth-

ority' of computers and demonstrated more 'respect' to feedback as opposed to that given by trainers;

- Means of testing learning abilities before embarking on full/part-time degree courses;
- And a uniform training message.

II. Barriers to Growth

Although the benefits to be gained from FDL are impressive, the market research has shown that the adoption of FDL throughout Europe is still in the early stages. The penetration of FDL based training differs widely in the various Community States. However, there are several common barriers among the states that inhibit the adoption of the new methods of training.

1. Market developments tend to be evolutionary rather than revolutionary. The development of Personal Computers heralded the age of cheap computing power, and exposed a wide section of the working population to the benefits of computers. However, it is hard to believe that PCs, in the form we know today, have been around for little more than 10 years. It was not until the middle to late 1980s that PC prices started to tumble and became affordable for general use.

The market research has shown that early adopters of FDL started experimenting and seriously considering the use of FDL during the late 1980s. Hence in terms of the market development of FDL, companies are still in the process of evaluating benefits and feasibility of FDL. This picture is true for the more technically advanced countries like Germany, Denmark, France, United Kingdom, whilst in Southern Europe organisations are still experimenting with the use of FDL.

It is doubtful that an FDL market exists in Greece or Portugal.

2. Thus, market awareness of FDL benefits is not widely spread across the decision makers within the various organisations. Consequently courseware suppliers are forced to sell the concept of CBT and other FDL courseware at high levels within the organisation before they can sell their products to the training departments. One popular method, of introducing decision makers to the benefits of FDL, was to target marketing departments on the use of multimedia and other courseware programmes.

3. Cultural and psychological issues act as a strong demotivator to the adoption of FDL systems. There is evidence that organisations have

not properly planned or paid sufficient attention to the needs of the employees.

Both trainees, trainers and, in some instances, trade unions objected, for different reasons, to the use and introduction of FDL. Role confusion, loss of social contacts, threat of job loss, loss of team work and weariness of technology (especially from the senior generation of employees) have all acted as barriers to the adoption of alternative training methods. In one country, employees perceived training and opportunities to visit the company head office in a major city as a perk. Consequently optimum use and benefits of FDL could not be achieved.

4. The high cost of equipment and courseware has prevented the use of FDL in Small and Medium size Enterprises. Large organisations have held back on investments in FDL for similar reasons. The cost of generic CBT courseware ranges between ECU 50 to 7,000. It is difficult to put a cost on customised CBT courseware, but one German supplier quoted a price range of up to 0.5 MECU. Video-disc/tape production costs range between ECU 3,250 to 50,000. The cost of an interactive video system is ECU 4,000 to 17,000.

It was not possible to assess the extent of the cost factor impact, since the majority of organisations researched have not conducted a proper and thorough financial evaluation of FDL based training. Hence no hard data is available to quantify the cost effectiveness of FDL. However, for large organisations, it is fair to state that the majority of FDL delivery systems already exists within the organisation, or the incremental cost of acquiring them is low. Similarly, courseware costs can be offset against a large number of trainees. Thus the cost issue is a major problem for small rather than large organisations.

5. A lack of strong competition within the courseware supplier market has meant that users have little awareness on product availability and FDL benefits. They are also unable to obtain generic products that meet their own specific requirements. On the other hand, the overall market will benefit from increased competition since this will improve user awareness of FDL potential benefits. Similarly the suppliers will be forced to improve the quality of their products and put more emphasis on the pedagogical aspects of their products. Increased competition will also force industry standards to emerge, thus reducing the uncertainties associated with the product selection process. Increased competition will also lead toward

equipment cost reductions and increased investments by users.

6. Traditionally, training expenditure is charged against revenues, but this is not true for FDL systems. The systems are treated as capital items and hence different justification and authorisation procedures apply.

7. Courseware product life cycle is reputed to be in the range of 1 to 5 years, depending on the course subject. The short product life cycle coupled with the high cost of products is causing investment decisions to become more difficult.

8. Rapid technological advances and the advent of non compatible technology (such as interactive video, CD-I and DV-I) are forcing users to postpone their investment decisions. Similarly, suppliers are reluctant to develop courseware for products that are threatening to become obsolete within a short period of time.

9. The market within the European Community is not considered homogeneous by suppliers and users, e.g. regional variations exist between the Benelux countries, and between Northern Ireland and the Republic of Ireland. Hence it is difficult for suppliers to achieve economies of scale. The incremental costs of translating/adapting a CBT course to suit the needs of another country is estimated at 30% of the original costs. In the case of videodisc, the increment could be nearer to 100%. The market research has not identified a courseware supplier operating on a pan-European basis. German based courseware suppliers tend to concentrate on German speaking regions of Europe. Spanish suppliers are investigating the viability of South America as a market extension for their products.

Market Related Questions

Are suppliers doing enough to encourage fast market development? Why not? How can they encourage faster market development?

Will the industry benefit from the highly competitive supplier market? If so, how can competition be encouraged?

Is FDL based training affordable? How can suppliers make FDL training more affordable? More widely available?

Is there sufficient opportunities for new entrants in the courseware supply market? Is it desirable to encourage new entrants? If so, what steps need

to be taken to encourage new entrants?

What are the key market drivers in the courseware supply industry?

Does a pan-European courseware market exist? Should it exist? If so, what are the benefits? How to encourage such development? Are existing suppliers strong enough to exploit such an opportunity?

What lessons of PC software market development can be used to help courseware market development?

PC industry benefited from regular computer shows and exhibitions, can the same approach be applied to FDL supply industry? If so, how?

Environment Related Questions

Can FDL training meet the requirement of future corporations? Why/why not?

How to speed up FDL market development and take up by potential users?

Currently it takes 300 hours to develop 1 hour of CBT How can the process be reduced?

Should there be a minimum standard of pedagogical value in courseware? Will the industry benefit from the introduction of such standards?

Are national governments/CEC doing enough to promote the benefits/awareness of FDL and training in general? What steps are needed to improve market awareness?

With diverse and fast developing technology in potential delivery systems, what are the minimum standards required to protect investments (by users and suppliers)? Should these standards be defined or be market driven?

Is current CEC legislation on software copyrights strong enough to protect courseware suppliers investment?

Users Related Questions

What steps are required to increase SME awareness of training benefits? Why can practical steps be taken to encourage training take-up by SME?

Should large corporations provide training to their SME suppliers and customers? Are there such examples? How can the process be encouraged? Should it be encouraged?

Is FDL training cost effective? Are there alternative options in future training?

Are current users doing enough to overcome cultural resistance and fears of FDL?

What steps should be taken to overcome the problems?

Whose responsibility is it?

- The user?
- The supplier?
- The trainer?
- Or the environment?

User requirements for technology-based learning

Chris Lloyd, Transcend Technology Limited

Curriculum Vitae

Aged 30, Chris Lloyd is responsible for the strategic planning of Transcend Technology Limited (TTL)'s business, as well as for marketing, quality controlling and managing its considerable research and consultancy work for public and private sector clients in the UK and the rest of Europe. This work relates to the development of human resources and the design, delivery and marketing of training services, which is Chris' particular area of expertise.

A founder director of TTL, he has also been employed as a market analyst, editor, teacher and consultant. He graduated from the University of Newcastle upon Tyne (1980) with a B.A. honours degree in English Literature and was subsequently awarded a Master of Arts degree in 20th Century Literature (1982). He is currently studying part time for a MBA at Warwick University.

TTL is currently involved in a number of European R&D programmes. It provides Technical Management and makes a significant research input to DELTA project OSIRIS (Optimum Standards for the Successful Market Integration of Multimedia On-Line Services). It is leading SPRINT project RA226 (Quality Standards for Training Technology). It is also investigating electronics related employment in PETRA and evaluating the exploitation and management of strategic research in ESPRIT.

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Abstract

1) The broad consensus of opinion is that user requirements are important. However, on closer examination this consensus soon starts to break down. Similarly, when considering the relative importance of user requirements to the development, design and marketing of Advanced Learning Technologies (ALT), it becomes apparent that the significance of user requirements is, in many cases, confused.

2) This presentation will introduce the issues which affect the perception of user requirements and in so doing reflect upon:

- What are user requirements?
- What is their importance?
- How are they defined?

3) The way in which user requirements are defined is largely dependent upon the perspective from which the problem is approached. ALT is used in different ways and at different levels by

- learners
- trainers
- organisations.

4) The correct definition of user requirements will be dependent upon the perceived relationship between commercial and educational objectives and the way in which these are approached.

5) Essential to the understanding of the above issues is the examination of the way in which the definition of user requirements is approached.

6) Essentially, there are three basic schools of thought:

- The quantitative. This proceeds by concentrating upon the immediately given or manifest aspects of an event or situation and thus takes the form of fact finding.
- The interpretative (hermeneutic). This proceeds in a less direct manner by taking significant singular cases and/or the latent meaning of aspects of an event or situation and context in order to determine the relationship between the various elements of that context.
- The critical. This attempts to determine the hidden or suppressed aspects of a situation or event by penetrating behind meanings diagnosing symptoms and

linking relations between aspects or situations to the contextual conditions.

7) Each of the above approaches is equally valid and they are in many cases complementary. What is required within DELTA is sophisticated methodological self-understanding of the best ways to identify the criteria which will determine which user groups are addressed and which approaches should be used to attempt to define the requirement.

8) One way in which the DELTA initiative has attempted to address this area, is through the work of the OSIRIS project. The project has been concerned with capturing user requirements from the perspective of market integration.

9) The following areas of research will be presented in case-study form with outlines being given of the methodological debates, research approach and findings. User requirements are examined from the perspective of:

- The user, both as learner and trainer, defining their requirements in terms of current and emerging use of ALT in relation to existing products and marketing strategies.
- The user as society, where requirements are derived from an examination of social, organisational and economic trends and movements from the perspective of the likely impact of Open and Distance Learning scenarios.
- The user as training expert, defining the idealised and best practice components of ALT-based systems from the perspective of his/her current expectations.
- The lead user group, defining their requirements from the perspective of previous experience and market influence through the medium of identification of requirement conceptual elements.
- The user as an abstracted component of the larger "training system environment", with requirements being reflected in terms of a generalised framework.

10) Through an outlining of the above, it will be possible to explore the current debate concerning the appropriateness of different research paradigms, user group definitions and research methodologies.

Presentation of the theme

Standards and guidelines for technology-based learning

Corinne Hermant and Lieve Van Langenhove

Presentation

Standardisation, portability and interoperability are prerequisites for an effective and economic learning market. Standardisation should be both technology and market driven and based on existing and emerging standards and conventions. In several areas, it will be necessary to define new specific standards and conventions for educational technology over and above those already existing. One major problem identified here is that those standards which are behind proprietary innovations are often defined with no involvement of end users. These topics were discussed during this workshop with the emphasis being on whether DELTA should study purely technical standards or rather focus on guide-lines of a more pedagogical and economic nature.

The topic was discussed within three parallel sessions:

- Standards for the design, production and use of learning technologies (session A)
 - What are standards? How to build a common platform of tools for design and production of advanced learning technologies in Europe?
- Markets and standards (session 2B)
 - Top-down versus bottom-up approaches. Are there specific learner/user interfaces? Which standards are in use for the development of learning materials?
- Standards for learning in European Networks (session 2C)
 - What network standards are needed? Under which conditions do networks have an added value for learning?

The following is a brief overview of the discussions held and the research results obtained by DELTA projects in the Exploratory Phase of DELTA.

Standards and/or guide-lines

Two different approaches and viewpoints have been researched within DELTA:

- Standardisation of ALT from a technological viewpoint (e.g. the DELTA project LEAST).
- Multi-perspective view on Advanced Technology Learning (ALT) standards based on user requirements (e.g. the DELTA project OSIRIS).

the DELTA project LEAST analysed the existing and emerging technical standards following the classic sequence previously mentioned. It tried to identify the areas for further standardisation broken up into the four environments of learner, author, tutor and production. Technical standards were conceived as product-based solutions to the problems of interoperability and they contributed to the development of the fundamental ground, platform or architecture perceived to be essential in supporting learning services. Two examples of relevant areas of technical standards were the interface between computers and videodisks and text interchange protocols. The difficulties inherent to this approach were twofold: a) defining the relevant areas of standardisation and b) defining the criteria to assess the nature and rate of change.

The general orientation of OSIRIS, on the other hand, has been to clarify the boundaries of the logic of standardisation in learning technologies. OSIRIS has focused on the standardisation process rather than the actual standards, since the process of specific standards utilization is not yet very advanced, although it will in the end prove vital to the widespread uptake of ALT

OSIRIS has taken a multi-perspective view, with emphasis on the real user requirements. The strategy used was bottom-up considering the market dynamics wherein learning takes place and the actual and perceived users' needs. The central issue was how to describe and model the technical systems on the basis of user requirements, within a realistic economic environment. The value of this approach lay on the emphasis put on the users' expectations rather than to the actual technical system.

This project differed in that emphasis was placed on roles rather than functions, highlighting the importance of the persons and their communication system. Learning was seen as a collective and social process of communication between persons rather than as an information transfer. Instead of following the classic sequence of requirements - functionalities - architecture - specifications, an analysis was made which provided an insight into both the relevance of technologies to the learning problem space and to the mechanisms which govern the relationship with user requirements. This approach led to prescriptive scenarios for implementation built on a dynamic, architectural model of the learning process.

On the other hand, it became clear during the workshop discussions that in order to clarify standardisation processes, one had first to clarify the user requirements. Currently expressed requirements are the basis of current standards and emerging requirements, the basis for future stand-

ards. The focus should be on the role that markets play in developing and determining between standards and homogenisation of users' present and future requirements. Technical standards by themselves are less of a priority for DELTA; they should be considered as just one of the levels of standardisation.

The first level of standardisation is a common language/understanding of the learning technology space. The idea of a common language is more embracing than the achievement of a common terminology which issues from more technical concerns. The reason why such a common understanding is so difficult to achieve is that learning technologies deal with one of the most difficult conceptions: the nature of human learning, both individually and collectively.

Such a common understanding gives rise to a common terminology and a common framework. Both OSIRIS and LEAST came up with a reference framework: OSIRIS developed a high-level architecture defining the roles of the technical system within both the socio-technical supply system and the broader demand environment. LEAST developed a technical framework situating the functions of the different actors.

The two lower levels are more technology-related: guide-lines for courseware design and use and pure technical standards (de facto standards and those recommended by the standards bodies).

Common understanding, common terminology and framework for standards should be emphasized within DELTA; guide-lines and standards should be derived from other disciplines and research programmes (RACE, ESPRIT) and provided as input to DELTA projects.

In general, it was felt that from the stand-point of DELTA, little could be done to influence the standardisation procedure at the level of the activities of standardisation bodies. But DELTA could do much to bridge the gap between technology markets by concentrating on user demands and

achieving the necessary interoperability.

There was a general agreement that the approaches of LEAST and OSIRIS could, in fact, meet. On the one hand, there is a model of technological systems based on researched user requirements applicable to a range of uses. This model entails the development of a high-level architecture in which the socio-technical system which meets the requirements of primary demand actors is identified. This high-level architecture defines the role of the technical system within the socio-technical supply system and the broader demand environment. From such a model on human requirements, guide-lines or recommendations (rather than standards) on technical components may be derived from courseware design, quality measures, etc.

On the other hand, however, one also needs a very detailed, technical description of a low-level architectural model. In this case, a purely 'user perception' is not sufficient. At low levels (hardware/basic software), technical standards are indeed necessary components of the communication language between ALT components and people involved in their production and use. However, this all depends on the level and area of standardisation concerned.

The question, therefore, is not whether these two approaches can meet but how and at what level they can do so.

The keynote speech by Mr. Sala and the following contributions:

- Mr. Bulthuis for the Session "Standards for Design, Production and Use of Learning Technologies"
- Mr. Fromont for the Session "Standards for Learning in European Networks"

are herein set-out.

Which standards and conventions are appropriate for advanced learning technology in Europe?

Giuseppe Sala, Datamont SpA

Giuseppe Sala, aged 50, is currently the Director of both Strategic Planning and Research & Development at Datamont SpA, the information technology and telecommunications services company of the Ferruzzi Group. These responsibilities involve guiding Research and Development in Information Technologies towards the specific needs of a broad variety of contexts of use, from food processing to chemicals manufacturing and financial services.

A Master's Degree in Mathematics at the Milan University has, through participation in seminars and specialisation courses, provided the basis for expertise in areas such as numerical analysis, compilers and programming languages for large-scale systems, complex operating systems, methodologies of company analysis and organisation and the design of complex systems.

His working life has, for the last 23 years, been focussed on the strategic integration of advanced information technologies, telecommunications in particular, with companies such as Sperry-Univac, Bassani Ticino, DBMA and Dataconsyst. Activities have ranged from marketing to the development of reticular databases and electronic mail services and the management of training for their effective integration. Both at Bassani Ticino and Dataconsyst, new business structures were established to meet growing needs.

Under his direction, Datamont's Research and Development Centre has grown rapidly over the last three years to form a central core for Datamont's strategy overall. In Delta, Datamont has made significant contributions to project Osiris (Optimum Standards for the Successful Market Integration of Multimedia On-Line Services).

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Speech

Osiris (DELTA project 1002) has been investigating the issues of markets and standards in different situations and socio-economic conditions. Some of the basic conclusions of this research can be summed up in the following points:

- the current learning technology market is still immature, fragmented and perhaps in need of standards and guidelines to assist the integration of ALT, especially into corporate training activities;
- there is an evident misfit between supply and demand; users require a cost and learning effective, service-oriented approach to meet their needs, while suppliers build their offer in the perspective of solutions based on single technologies;
- the ALT problem space is unevenly perceived and poorly structured and is only partially understood by ALT actors;
- the concepts of "standards" and "standardisation processes" have a much broader meaning when seen in the wide-ranging perspective of the effective market integration of learning technologies.

To overcome these problems, the Osiris project has developed a Reference Framework Architecture. This addresses all ALT actors in a meaningful way to enable a better understanding of the market and technical implications of user requirements.

To do so, it models all the dimensions of the learning problem space, including human competences, processes, knowledge structures, technologies, products and so on. Most importantly, the Osiris Reference Framework Architecture provides a meaningful framework for the development of recommendations and guidelines which can have a positive impact on standardisation processes.

The issue of standardisation is crucial for successful market integration of ALT, yet can only be addressed within this wider perspective which takes social processes into account. In this context, standardisation processes are seen to play three basic roles:

- first, to promote the welfare of society through a wider range of actors and more widely diffused technologies, with the direct involvement of both in standardisation processes;
- second, to promote the economic effi-

ciency of human efforts and of the use of energy and materials in the production and exchange of goods and services;

- third, to establish guidelines and regulations for the design, development and implementation of technologies.

It should be clear by now that initiatives to promote standardisation must be perceived to have widespread applicability by the socio-economic context which is to adopt standards. To this end, it is important to focus on a standards strategy for Advanced Learning Technologies that falls into the space between standardisation concept and efforts in education and training. This strategy must also establish the means of demonstrating the value of particular standards in real and relevant contexts of ALT in use.

From this point of view, it is important that standards mainly satisfy conditions of likely use, in their market, social and psychological dimensions. In this sense, Osiris is providing a significant contribution in focussing on achievable areas of technical Open Systems standardisation.

From the user's standpoint, the key standards will be those that satisfy need of interchangeability and upgradability. They will have to be dynamic and flexible enough to act as forces driving innovation rather than freezing it.

From the supply side, key standards will help to develop market strategies in the early processes of formation of an Advanced Learning Technologies market. This could - in the Delta perspective - be achieved through the establishment of a basic learning infrastructure that could be marketed at an affordable price throughout Europe.

A central concept in emerging in Delta to meet this goal is that of a Common Training Architecture. The idea is to provide developers and user with an open architecture that encompasses relevant industry standards, formats and protocols.

A clear need for a Common Training Architecture exists, yet there are some dangers which accompany this concept. The most evident lies in the temptation to address the problem as one only of technical specifications without regard for user requirements and realistic considerations of price and use.

In order to provide a major contribution to the success of standardisation processes, the Common Training Architecture must be a reference for consensus-forming from both the supply and the demand point of view. It must address the relevance of technology to learning, and not technological architectures in isolation.

The key objective is to provide appropriate technologies and communication services to European users at a price that they can afford. On the basis of the above considerations, the Osiris Reference Framework Architecture is an important starting point.

From there, a realistic minimum standardised (or rather standardising) platform could be described, which is capable of addressing pre-normative standardisation processes from the three major perspectives which guide those processes:

- the society perspective, with a clarification of relationships between learning and training at the symbolic and institu-

tional levels and of the nature of the technicisation of training;

- the economic perspective, with an interpretation of the economics of standardisation based on the relation between knowledge and human capital formation and on theories of economic integration;
- the socio-technical perspective as the guiding force of technical standardisation, with methodologies for establishing the relations between pedagogical and didactic objectives.

Standards for the design, production and use of learning technology

Willem Bulthuis Philips IS, Innovation Centre

Curriculum Vitae

Willem Bulthuis studied Instructional Technology at the Technical University of Twente. Since 1986 he has been employed by Philips Information Systems, first in Apeldoorn (NL), working on the development of authoring systems and intelligent help systems. In 1988 he set up a group dedicated to Knowledge & Information Transfer Systems (covering learning technology, authoring systems and multimedia CD developments), which is currently based at the Philips Innovation Centre .

He has been involved in DELTA since 1988, as coordinator in the Pre-Pilot Project, as member of the Technical Panels defining the workplan for the Main Phase and in the Programme Committee of the DELTA and Beyond Conference. Currently he is project manager of the DELTA project SAFE (on authoring tools). Furthermore, he is managing the ESPRIT project OSMOSE (on application standards for CD technologies and multimedia authoring environments).

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Abstract

Approach

This session focussed on:

- "what" should be standardised in the field of learning technology (in design, production, and delivery)
- "which" standards are available already (from other disciplines).

Concerning the question "how" to standardise, this session was restricted to the design and production process.

The session was introduced by a global overview of which topics could be considered for standardisation, what levels/degrees of standardisation could be envisaged, and which types of actors are involved. An overview of existing standards was addressed only marginally.

Background

In general, most discussions about standardisation in the IT world are concerned with portability of applications. In the context of DELTA this means both the portability of learning material (on different delivery platforms) and the portability of authoring tools (on different authoring platforms). In relation to the use of telecommunication facilities, interoperability between learner tools and tutoring tools is also relevant. Furthermore, flexibility (or adaptability) of learning material is important (from a tailoring perspective), as well as continuity (from a publishers and end-users perspective). Last but absolutely not least, the issues of cooperability of development tools and of re-usability of half-fabricates is crucial to realise large scale learning material production.

It is not always necessary to realise full standardisation in order to achieve the issues mentioned above. In many cases some form of harmonisation (eg. using a common description language) will be sufficient. The acceptance of a common framework for a specific aspect, how-

ever, is essential.

A broad range of actors have very different interests in standardisation: IT industry, service providers, operators, tool builders, software/courseware houses, publishers, training departments, tutors, learners, and the society. All these different perspectives were addressed in the discussion.

Some (provocative) questions to be addressed:

- › Is standardisation/harmonisation of authoring tools more important than standardisation of delivery platforms?
- › Will there ever be one authoring system covering the whole development cycle and all types of learning material?
- › How could tools be made more cooperative?
- › Should (authoring/tutoring/learning) tools be portable?
- › Do we need "high level" (semantic) standards, or low level technical standards?
- › What roles can frameworks play?
- › Should we make standards, or should we use defacto standards?
- › Is there a need for user interface standards, other than to achieve portability of learning material?
- › Can there be separate standards for dissemination by telecomms and for publishing by physical carrier (CD, floppy, flash card)?
- › How could re-usability be improved by standardisation?
- › What standards are coming out of the DELTA Exploratory Action?
- › What should DELTA do about standardisation, and what are others doing?

Standards for learning in European networks

Joseph Fromont, CCETT

Curriculum Vitae

Joseph Fromont has been an engineer at CCETT (a public joint research for broadcasting and telecommunications) since 1981.

His activity started in the field of authoring systems for TELETEL applications, and then, he worked in the field of ergonomic tools for designing multimedia applications. He currently leads the "RAVI" team in the "audio-videographic applications and authoring tools" department. He follows up and coordinates the industrial developments around RAVI. He is involved in the DELTA program through two projects: LEAST and EPOS.

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Abstract

Introduction

The setting-up of communication networks on a large scale will play a key role in the development of broadcasting networks permit the exchange and distribution of information in many ways. Value-added services, proposed by technical or commercial operators and not necessarily depending on the training area, will improve training by setting-up advanced technologies.

Two main types of networks exist:

- Telecommunications networks (telephone, PSDN, ISDN) allowing the sending of information in both directions through the same channel.
- Broadcasting networks (cable, satellite) allowing the sending of information in one direction.

In the area of communication networks, three main services have been identified: downloading, telecommunication and person to person dialogue in which a wide range of learning services are found.

All three of these communication services must be set-up in communication networks by using codings and protocols. Codings are used to represent learning materials and can be standardised or not. Protocols are used to exchange learning materials. They are provided by the communication system and therefore depend on it.

The following scheme shows what protocols are used in communication networks performing communication services:

Learning communication services

Learning communication services will have two objectives:

- The first of them is to link the systems together, namely to allow the exchange of data. This, for us, is the area of multimedia interactive applications.

It is quite obvious that these links are settled by means of protocols since the aim of such applications is to provide access to powerful central computers from a simple terminal via a data transmission network. It is also possible to imagine the transmission of live data previously stored on a mass storage device (hard-disk, CDs, etc.), via a network which would overcome problems of excessive delay, updating of copies on another support, etc.

It then becomes obvious that protocols have to be defined for both categories of configuration:

- Downloading of information: this function allows the loading of data on a workstation followed by local access to this information.
- Interactive Teleconsultation: this function offers the access to data produced and/or stored in a remote system.
- The second objective is to link people together in order to make them dialogue. These links allow dialogue between actors of a learning system. This dialogue can be either formal or informal, written or spoken and can be set up by different means:

Com Services /networks	Telecommunication Networks	Broadcasting Networks
Downloading	Downloading	Downloading
Teleconsultation	Remote/Distributed teleconsultation	
Person-to -person dialogue	Message handling Telephone Fax Telex Minitel Visioconference Audioconference	Videoconference

- › Message handling
- › Telephone
- › Fax
- › Telex
- › Minitel
- › Visio/videoconference
- › Audioconference

Downloading of information communication service

Definition of the downloading service

Downloading protocols are used for local execution and they corresponding to file-transfer files between an administrator-server and a user workstation. The downloadable information may be a courseware or any type of learning material (e.g. data extract from a database, dictionary, etc.).

The downloading service allows:

- To transfer complete information which can be processed on the workstation. The transfer is possible in both directions:
 - › From the administration server to the execution system, in order to load the information itself.
 - › If necessary, in the opposite direction to return execution results.
- To transfer only pieces of information:
 - › When learning material is too large compared to the storage capacity of the station or the network data flow rate.
 - › When the user wishes to use only a part of it.
 - › When the user wishes to boot the information quickly (without waiting for it to be completely loaded).
 - › In case of update of learning materials, it is more cost-effective to transfer only modifications rather than the whole new information.

Existing applicable standards to set-up this service

Existing applicable standards to set-up this service on telecommunication networks.

- FTAM:ISO 8571: File Transfer Access and Manipulation
- CEPT T/TE-06-04: Videotex processable data basic kernel

- ETS G (temporary reference): Videotex processable data (equivalent to STU-TEL)
- ETS 300 075: Specification du Télé-Echange de Logiciel (Software remote exchange specifications)
- PEL (RAVI Volume 3): based on STU-TEL

Existing applicable standards to set-up this service on broadcasting networks.

- DIDON: data broadcasting

Examples of Learning services based on downloading service

- Learning materials downloading server
- Learning material selection
- Diffusion of updated learning materials

Interactive Teleconsultation communication service

Definition of the Interactive Teleconsultation service

The interactive teleconsultation function allows access to remote information. The presentation agent and execution agent are located in different areas. The data which are transferred on networks belong to three categories:

- Acquisition of information from different means
- Restitution of different presentation media
- Synchronization of different presentation media

Existing applicable standards to set-up this service on telecommunication networks

Contents coding

- CEPT T/TE 06-01: Defines the alphamosaic and photographic coding as well as four alphamosaic profiles, Profile 2 being used by Télétel.
- CEPT T/TE 06-02: Defines geometric coding.
- CCITT G.711/G.721/G.722: Sound coding standards

Application layer

CCITT X3/X.28/X.29: Used for PADs and the

protocol between PAVI and defined Télétel servers (terminal-to-host (THI) based on X.29 and Gateway-to-Gateway (GGI) based on T.564) and 3 syntax coding systems (ANPLPS, CAPTAIN and CEPT).

CCITT T.564 for Gateway-to-Gateway videotex interworking, which is part of the ODA DTAM framework and based on numerous other recommendations concerning videotex interworking:

- Recommendation T.504 defines the profile of the display structure, i.e. the rules for the use of the document structure T.412.
- Recommendation T.541 defines the profile of the input structure, i.e. the description of the elements in the operational structure T.441.
- Recommendations T.432 and T.433 define, respectively, the service and protocol provided by the DTAM layer. The DTAM layer is based on the lower OSI layers.

ANSI xxxX Windows: Window management protocol orientated towards local networks. Currently being standardised.

Low layers

CCITT X.25: Low layers for packet networks.

T.90: Low layers for the ISDN based on X.25 and LAPB (minimum header options, Transport layer).

Intermediate layers

CCITT X.224/X.225/X.226/X.227: Transport, Session, Presentation layers OSI CASE (their added value is very low in the case of interactive teleconsultation applications. To be used sparingly and only to ensure conformity with the OSI).

Examples of Learning services based on Teleconsultation function

- Learning material teleconsultation selection and processing
- Learning material management
- Users management
- Access to a remote database or a knowledge based system

Person-to-Person dialogue communication service

Definition of the Person-to-Person Dialogue service

This function allows dialogue between actors of a learning system. This dialogue may be formal or informal, written or spoken and may be realized with different types of equipment:

- Message handling
- Telephone
- Fax
- Telex
- Minitel
- Visioconference
- Audioconference

Existing applicable standards to set-up this service

Existing applicable standards to set-up this service on telecommunication networks

- Message handling: CCITT X400
- Telephone
- Fax
- Telex
- Minitel
- Visioconference: CCITT H.261
- Audioconference

Existing applicable standards to set-up this service on broadcasting networks

- Videoconference

Examples of learning services based on the person to person dialogue service

- Informal or Formal dialogue
- Tutoring
- Training with visioconference

Presentation of the theme

Effectiveness of technology-based learning

Corinne Hermant and Lieve Van Langenhove

Presentation

There is an extensive need for advanced learning technologies (ALT) which could provide an effective response, in terms of both investment and efficiency, to the demand for more flexible and distance training. The topic was discussed during three parallel sessions:

- Investing in Learning technologies (session 3A)
- Learning efficiency (session 3B)
- Policy issues (session 3C)

The following gives a brief overview of the discussions and the research results so far obtained by projects in the Exploratory Phase of DELTA.

Cost and investment effectiveness

The new technologies will play a substantial role in expanding and enhancing distance and flexible learning if they prove to be cost-effective. The reduction in costs of software and equipment and the cost effectiveness of new methods of training compared with traditional methods are key issues for the acceptance of ALT. Their cost-effectiveness relative to traditional media is not self evident. At present there are no adequate analyses of the costs or benefits of the new technologies when used for distance and flexible learning. Research and development into appropriate methodologies and methods for cost-benefit analyses is urgently required. These should play an important role in the context of future DELTA research.

Studies have been carried out in the following areas:

- development costs
- execution costs
- costs of learning materials
- user infrastructure costs
- access and communication costs

The results of these studies show that technologies are cost effective when dealing with fast changing knowledge versus slower changing, and matters which are skill-based rather than knowledge (such as mathematics) or culture based. Learning technologies prove to be inexpensive in situations where a large number of trainees can 'pay for' a course and when the development of an infrastructure can be paid off through a large number of products.

As most of the training departments have no capital budget, two requirements were stressed: the

reduction of expenditure related to new configurations and the mass diffusion of ALT products on stable equipment in order to obtain cheaper products.

Access and communication costs for the traditional courses are in practice higher than is generally realised. One third of university course attendance costs can be attributed to access and communication. For companies this factor can even account for half of total course costs, when hotel and travel expenses are included. The costs of learning technologies are considerably lower, and estimated at 10-50% of direct learning costs.

The single largest component of training costs is working time lost by trainees. This accounts for as much as 85% of the total training cost, depending on the type of training and personnel involved. For example, British Telecom uses a CD-Rom system (costs: 6 million ECU) to train its operators to use computerised telephone exchanges. With more traditional methods, the cost would have been as high as 60 million ECU. Lloyds Bank have calculated that the use of interactive video and CBT for product knowledge training has saved them 9000 hours a year. IBM claims it has cut 1000 man years off the time taken to retrain staff transferred from R&D to sales and system engineering by using CBT. Another attractive benefit is the money saved in users' travelling and salaries for the instructors.

Most comparisons of costs are based on models which demonstrate the critical level of users necessary in order to pay for the costs of developmental infrastructures. The difficulty is to obtain an accurate estimate of the minimum costs and number of users needed before investment of money in "automated" ways of learning (educational software and video) in the workplace or at home becomes viable. An estimate of the costs of development of interactive media is also needed. The only statement which can be made, and which is confirmed by existing practice, is that: the more interactivity or more 'intelligent interaction' a learning multimedia product has, the more costly it will be.

Cost studies are relatively few in number and for the most part relate to well established media, primarily television and, to a lesser extent, radio. Moreover, for the most part, these studies are focused on macro-economic investment decisions rather than on the use of the new technologies in operational distance learning programmes. A field survey of 73 European companies by BISFACT failed to uncover a single organisation which had carried out a formal exercise in ALT cost effectiveness.

Several reasons were found for this lack of re-

search:

- absence of a model to assess the cost effectiveness of training
- training departments were not required to provide detailed cost/benefits analysis
- training is treated as an expense rather than an investment from an accounting point of view.

However, the successful introduction and implementation of technology-based learning will ultimately depend on the availability of a framework to assess the overall benefits to the user organisation and the cost effectiveness of ALT in comparison to other training methods. Sir Robert Telford stressed the importance of future investment in human resources (trainers, organisers of training, etc) in the context of European competitiveness.

Relatively little is known about either the costs and cost-effectiveness of ALTs or of the cost of non-training when traditional methods fail. This is an important omission. It should be stressed that no matter how pedagogically effective a particular training method may be, it is unlikely to be extensively used if the costs of developing and delivering its courses are substantially higher than those of the established media.

Learning efficiency: a problem of methodologies

New technologies must improve the efficiency of the learning process. They must also facilitate transfer of skills, possibly taking into account the learners' pace and style. Few evaluations have been carried out so far.

One of the major results from the case study reviews by the DELTA projects PRECISE and EIOL, was that

'perhaps the most important factor contributing to the effectiveness of technology-based learning is the matching of pedagogical methods to the educational aims of the course and the learner'.

Active learning methods are important for understanding. Multimedia learning technology is useful in providing a rich environment which suits a variety of pedagogic and individual learning styles. Finally, the effectiveness of learning technology in distance and flexible learning crucially depends on the support and positive attitude of the organising body or institution.

The workshop session on learner efficiency raised a number of interesting questions about the learning efficiency of the new educational technologies and how this efficiency could be understood. A vital issue, underlying the whole area, is the question of whether the measurement of 'learner efficiency' should have different criteria, depending upon whether new technologies or more traditional techniques are being used. The new technologies are often considered to be more effective, but it is necessary to develop methodologies to establish this effectiveness. All participants were convinced of the need to look at learning efficiency within the whole learning system with an emphasis on the total quality approach.

An outstanding problem however is how the efficiency of a learning process can be measured within the context of a total training system. Most participants agreed that the issue is critical but unexploited in recent research.

The effectiveness and quality of the learning process could be measured at different stages:

- before the implementation of the training scheme. Innovation within industry and research should be justified in terms of benefits, return on investment, exploitation and sales schemes, market rationale.
- during the training process
- after the training scheme

and on different levels:

- the user in terms of the quality of the learning process and outcome, the quality of the design of a course
- the level of the organisation in terms of performance, transfer of the trained skill
- the level of the training programme in terms of investment.

The traditional approach of efficiency measurement limits itself to plain indicators like time, speed of learning, retention, etc... For example Mercedes Benz developed a combined CBT and videodisc programme to train their employees on a complex mechanical subject. Evaluation revealed that 85% of the basic information was retained while using ALT in comparison to only 44% when using traditional teaching methods. Quantitative assessments of the motivation and satisfaction of the learner and long term performance are never made. In addition, evaluation of ALT is made by independent departments of the user organisation without any relation or exchange of results and methodologies.

The efficiency of the learning process should not be seen as a separate issue for training through ALT but as a crucial topic for all research on human actions of which learning is one. It is therefore necessary to follow the developments in human science disciplines such as psychology, technology assessment, etc... For example the major trends of evaluation and assessment studies reveal the importance and richness of analytical case studies.

Although learning efficiency is not a specific issue within educational technologies, it is a *sine-quanon* for the provision of "good" training through ALT. It is seen therefore as a critical topic for future ALT research.

The following criteria for evaluation and assessment of ALTs have been identified:

- prove in a pragmatic way how technology-based learning contribute to training.
- define clear objectives of each development and implementation in order to test them adequately.
- demonstrate in concrete terms the added value of the use of ALT in certain training settings, for certain training objectives and certain technical developments.

Evaluation of the learning process itself is a key issue in so far as it allows adaptation to style, pace and presentation. Keeping track of the learner reactions is one of the aspects of tutoring and monitoring systems, and broad evaluation of processes must be carried out in order to improve the interactivity and user friendliness of all systems.

There is now a growing consensus that learning systems should not focus on fact teaching, but should help learners to cope with information and knowledge. In this respect, emphasis is put less on solutions (good/bad, true/false) than on the process of problem solving. Another trend is the shift from information towards communication. Learning is seen as a collaborative process whereby communication with other (learners or tutors) stimulates insight and doing. Active reflection and learning by doing are key issues in apprenticeship learning and training.

Whatever skill or knowledge is taught, motivation is a key issue, because the use of ALT is increas-

ingly giving the learner control over learning. This shift is echoed by those companies who regard learning as an ongoing process. In the domain of pedagogics it is essential to maintain the interests of the learner throughout the process. Relevance of knowledge representation, information structuring, timing and screen design play a key role.

Policy issues regarding flexible and distance learning

There is a strong rationale for public intervention in the ALT market given that it is concerned with goods which may create social benefits, remedy geographic or social imbalances and increase the 'productivity' of learning. All these contribute greatly to the social environment. At a time of skills shortages and increasing human mobility, the quality of public training provisions has become a key issue. Regions and countries will stay economically and socially attractive as long as they are competitive in this area.

The different forms of public intervention, and their positive and negative potential impact, were outlined by Claudio Dondi. The various types of actions are summarised in the following table.

The financial support to producers (category 1),

NATURE OF OBSERVED POLICIES

1. Financial Support to customers
2. Financial support to consumers
3. Public call for tenders
4. Prices and tariffs policies
5. R&D Investments
6. Institution building
7. Technical assistance
8. Legal & regulatory policies
9. Agreements, norms and codes of conduct
10. Information and advertising
11. Technological infrastructure
12. Human infrastructure
13. Direct provision of ALT products

either directly through subsidies or indirectly through the funding of products (category 13),

raised a number of questions and discussions.

The extent of state intervention may vary from one country to another. The representative of DELTA project INTERMAPS (editor of DLT news¹) stated that 9 billion ECU were spent on category 1 in Germany. The funding was not backed by mechanisms for controlling quality of training and, in this instance, very negative effects were apparent. The representative of STARTUP reported similar negative effects concerning category 13. He stated that, in France for example, this policy had favoured the funding of sophisticated research products which had no market rationale, thus biasing the market dynamics. It was stated that State intervention resulted in some cases in keeping some semi-public institutions on the market, though they were not really commercially oriented. Moreover, policies would focus on tools rather than on the training system as a complex whole. Industrial policies did not necessarily equate to policies based on services to the public. Weaknesses in large public works such as the 'Plan Informatique pour Tous' in France were highlighted. It seems that such operations must address the profound changes introduced by the new technologies if they are to be successful. It was also indicated that the protection of national industry through grants could, in some cases, cause a certain degree of inefficiency.

There seemed to be better results from the financial support to consumers:

"This means that the price paid by the user will be lower than the price earned by the producer because the government is paying for the difference: in purely economic terms this does not represent an efficient value of benefits produced in terms of wider access to learning opportunities (especially for disadvantaged groups) and indirect support to

the producers." (Claudio DONDI, EIOL).

A representative of PRECISE underlined the importance of categories such as 'public call for tenders', 'institutions building' and 'human infrastructures'. Though they do not directly stimulate the market, these categories of public intervention are extremely relevant to all European actors involved in the research and the development of the ALT markets.

It was stated in conclusion that:

- Supply-side policies still prevail, and they should take into account the fact that training products are part of global 'services'.
- Infrastructure policies are frequent, but unbalanced.
- Specific legislation in open learning or telecommunications is seldom found, though some could be very beneficial in improving the credibility of new training approaches.
- Institutional buildings are no longer as popular as they were some years ago. When one is created, it tends to prevent the creation of others, thereby causing a lack of competitiveness.

The keynote speech by Geoff Toplis and the three session contributions by Ulla Shwarz on 'Investing in learning technologies', Glyn Martin on "Learning efficiency of ALT", and Claudio Dondi on 'Policy issues to ALT' are set out on the following pages.

1 DLT News, New technologies and learning in Europe. Periodic journal published by DELTA INTERMAPS project.

Effectiveness of flexible and distance learning in terms of investment and learning progress

Geoff Toplis, Training & Employment Agency

Curriculum Vitae

Currently Chief Executive of the Northern Ireland Open Learning Centre. He was Director of the Northern Ireland Training Authority from 1985 until his recent appointment to his present post. He has been centrally involved with the development, application and evaluation of technology-based training systems over the last eight years. He was Deputy Director of the Northern Ireland Training Executive from 1978-1985.

From 1970-1979 he was General Manager of the Food & Drink Industry Board (NI) having previously been responsible for Management Development with the Road Transport Industry Training Board (NI). He spent the first fifteen years of his career in the Coal Mining Industry.

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Speech

1. Introduction

It is a refreshing change to see the accent placed on investment in technology-based learning systems rather than cost. This is the right way to pursue the question of effectiveness, especially to potential users of Advanced Learning Technology.

2. What do we mean by effectiveness?

In the context of Advanced Learning Technology (ALT) applications, there are two major components or dimensions to effectiveness:

(a) Learning (pedagogic) effectiveness

This can be assessed and evaluated in terms of both quantitative and qualitative change in the learning:

- knowledge
- skills
- attitudes
- other behaviour

(b) Cost effectiveness

Measured through comparative studies of design, production and delivery costs of learning systems using alternative methods and technology.

3. Measurement criteria

Both components raise problems of measurement because of lack of any generally accepted measurement criteria. It is difficult enough to establish common criteria at national level and many times more difficult on a transnational basis.

4. Research into effectiveness

We urgently need a common framework within which effectiveness and return on ALT investment can be assessed. Without such a framework, comparative analysis - especially on a transnational basis - may not be very meaningful. Some useful work in this area has been done as part of the DELTA pilot projects but much greater priority should be given to this in any future workplan. We need a common understanding of:

- What constitutes effectiveness
- How it can be measured

- What can be included as costs
- How do we quantify benefits
- How do we measure return on investment

5. Benefits determine effectiveness

It is necessary to distinguish between **BENEFITS** and **FEATURES** of flexible and distance learning systems. Some of the benefits are already well known, such as:

- Improved **ACCESS** to learning opportunity
- Convenient **TIME** and **PLACE** for delivery
- Increased **SPEED** of learning
- Greater **RETENTION** by learner
- Improved **MANAGEMENT** and **FEEDBACK** of learning progress
- Greater **RELEVANCE** and **REALISM** (eg simulation)
- Lower **DELIVERY COSTS**

6. Case studies

We need to do much more work in seeking out examples of high returns on investment through describing and publicising case studies. The kind of evidence we need is indicated in the four case studies. (See table below).

7. Transnational co-operation in DELTA research projects

There is an inherent value in people from different member states forming consortia to carry out DELTA projects such as the lasting contacts which are made and good working relationships which often follow. I do believe, however, that in any future DELTA projects much greater consideration should be given to the question of "added value". This is important not only in relation to the contribution which each partner makes to the project but also in relation to the collective results. An important yardstick of the success of the project is whether or not the combined efforts of the partners and the pooling of their knowledge and expertise produces new information which would not have emerged by the partners acting independently. This should become the "acid test" for transnational research projects.

8. Transnational assessment and evaluation

One of the major difficulties in determining the added value of transnational projects is that we have not yet reached any common understanding of how benefits are assessed and evaluated. This is one area of research which is essential to the business of describing and quantifying the benefits from ALT in terms of the return on investment.

9. Technology overkill

Returning now to the central theme of return on investment from flexible and distance learning systems from a user standpoint, I have to say that in my view we are already witnessing a degree of "Technology Overkill" as a result of unnecessary or inappropriate application of technology to some learning situations.

Some of the larger private and public organisations are purchasing hardware, software and courseware and applying it to in-house learning needs which could undoubtedly be met more cost-effectively using less sophisticated technology. This is because the decisions to purchase the technology have not been subject to any in-depth cost/benefit analyses. Where money appears to be no object then there is a tendency towards a seductive attraction to technology which is held to be the last word by a salesman who knows how to exploit fashionable trends.

10. The implementation gap

What we need now is not more technology but more appropriate application and implementation in the education and training market place. Various attempts have been made to estimate the impact of ALT at this time in education and training delivery systems, and it would appear that less than 10% of all education and training courses have any significant flexible or distance learning content. This figure varies considerably between different user organisations at national level and is even more varied between member states.

My fear is that this gap between the development of the technology and its application and implementation to training will widen unless we do a much better job in identifying and selling benefits to improve market penetration.

DELTA has an important role to play in helping to close this implementation gap and in my view this is where the main emphasis should be placed in the next phase. Some of the pilot phase projects have laid the groundwork by identifying and publicising case studies of successful implementation where the return on ALT investment has been impressive. We need more of this kind of research followed by a concerted effort to disseminate the results and sell the benefits.

	Cost of CBT	Cost of other most appropriate media	Benefits after 1 yr use of CBT	% cost savings
Company 1	160,000	196,000	36,000	18.4
Company 2	49,500	105,700	56,250	53.0
Company 3	116,000	147,000	31,000	21.0
Company 4	150,000	155,000	5,000	3.0

Company 1 - Boiler systems operations, multinational chemical company
 Company 2 - Product Knowledge training - Life assurance company
 Company 3 - Computer software training - Building society
 Company 4 - Admin systems training - food retailing company

Source - Systems applied Technology limited

Parallel Working Group 3A

Investing in learning technologies

Ulla Schwarz, Export-Akademie Baden-Württemberg,

Curriculum Vitae

Ulla Schwarz is a trained economist working in the area of distance education - inclusive distance continuing education and distance vocational training - since 1970. She was the responsible manager for several projects in the area of engineering, medicine, law and communication sciences. All of the projects were worked out together with TV-station, universities, project groups and the Ministry of Education of the Government of Bonn.

Since October 1987 she is working at the Export-Akademie Baden-Württemberg, a central institution of the "Advanced Technical College for Technology and Economics" in Reutlingen. The Export-Akademie offers educational and advanced training courses tailored to the requirements of internationally active enterprises. The distance learning course "International Marketing", for which she is responsible, is a special training offer to managers and top members in small and medium-sized enterprises, who are already involved in international business or want to take active part in trading to foreign countries.

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Abstract

1. General remarks

At the end of this century we are faced with dramatic revolutions in technology, but even more in society with all its implications on economy. National economics have almost lost their individuality and converted into a network of international communication and cooperation but also competition.

These dramatic moves logically have impacts on existing economic structures and attitudes calling for their modification, restructuring or abandonment.

A basic precondition for the social and economic restructuring is a continued education, training and retraining not only of the responsible leaders but of the work forces as a whole. A great task which can be solved only by the use of the most advanced methods and tools of continuing education and vocational training.

In summary, education in the broadest sense will become the most important instrument for human resource development and only education and training can help to bridge the gap between already industrialised and between developing areas, countries and regions/continents.

The Delta program could perfectly meet the actual demand, since it is designed to support the educational requirements of different societies with various cultural, social and economic background and heterogeneous educational standards.

2. Continuing education and vocational training in companies - the federal republic of germany as an example

The FRG is among the most highly industrialized countries in the world. In 1989 Germany was the number one exporter, before USA and Japan. To maintain its position and training is of utmost importance for all companies, especially for small and medium-sized enterprises (SMEs).

In Germany, small and medium-sized companies (SMEs) play an outstanding role. For example: the land of Baden-Württemberg has more than 100,000 firms with less than 500 employees.

They are an important motor for change and innovation in industrial production and trade. Their flexibility, creativity and generally high productivity allow very rapid reaction to new de-

mands of the market.

Continued training and education on the highest level possible will be required to cope with forthcoming challenges:

- Rising labour cost and a sluggish or even declining economy.
- More personal free time (vacation, leisure time) means drastically reduced working time and less personal productivity.
- Because of the strong protection against the dismissal of even unqualified labour force by law, the efficiency of the single employee has to be considerably improved.
- The declining birthrate will cause a shortage of qualified employees, which will become even more drastic than it is already now.
- Production and service industries in Germany are highly know-how oriented and will be even more so (low-cost production is mainly done in developing countries). Therefore, the updating of collaborations is a pre-requisite for the companies' survival.

Cost and structures of professional training in German industries have been summarized recently. The "Institut der deutschen Wirtschaft", Köln, has carried out a survey. A representative sample of companies throughout Germany (more than 2,500) - different in number of employees and size of branches - were interviewed.

The overview shows a listing of pros and cons of continuing education and vocational training, such as determination of requirement, obstacles, structure and cost.

According to the poll, the following topics and answers were considered as "highly important or important":

a) Reasons/criteria for the determination of requirement:

- › specific requirements of the enterprise (61%)
- › qualification of the employee (49%)
- › shortage of well-trained labour force (40%)
- › market research (36%)
- › new investments (32%)
- › personal wish/demand of the em-

b) Obstacles against developing continuing education and vocational training:

- › time/other priorities (68%)
- › restricted financial resources (27%)
- › employees, not interested in further qualification (24%)
- › lack of qualified trainers (14%)
- › lack of training programs, which meet the specific needs of the company (10%)

One fifth of the responding companies do not see any obstacles against continuing education and training.

c) Employers, determined to improve education and training in their companies, listed the following reasons:

- › introduction of new technologies (56%)
- › preparing employees for more responsibility in the company (56%)
- › covering the demand of specialists (47%)
- › introduction of new products (39%)
- › opening- up and development of new markets (34%)

d) Organizational structure of further education and vocational training in companies:

Responsible for planning and realization of training programs are usually the owners of the enterprise or the board of directors. They also decide who and how many of the employees can attend the training events. The second important group in this special field are the heads of professional and human resources departments.

The types of training, listed in this survey, are:

- › training-on-the-job / learning by doing during working time
- › seminars, workshops, etc.
- › special information events, like trade fairs, expert meetings and lectures

The percentage of participants taking part in this training possibility is in relation to 2.3 million gainfully employed persons:

- › training-on-the-job / learning by doing (38%)
- › seminars, workshops, etc. (8%)
- › special information events (6%)

The position of the employee is correlated to his personal qualification. According to the survey most of the training events are open to the already best qualified persons like:

- › managers (63%)
- › employers and company owners (69%)
- › office professionals (76%)
- › only 26% of the untrained and unskilled workers get a special educational treatment

e) The evaluation of training effects is extremely difficult. Statistical methods are still not adequate to quantify exactly the outcome of seminars, workshops, etc. for the company and/or for the single employee. Nevertheless, there exists a number of qualitative evaluation procedures, which give at least a hint on success or failure. These procedures are:

- › verbal and/or written examination of trainings by the participants
- › verbal and/or written examination of the participants by the teachers
- › pre- and post-tests and examens, such as multiple choice questions, etc.
- › personal evaluation by officials
- › stating of job results by officials

If companies do an evaluation of achievement, they do it differently:

- Big companies with more than 1,000 employees prefer
 - › examinations by the participants (86%)
 - › evaluation by officials (55%)
 - › test and examens (46%)
- Companies with 100 to 999 employees make use of
 - › examinations by participants (54%)
 - › evaluation by officials (54%)
 - › stating of job results (39%)
- Companies with less than 100 employees evaluate the achievement by
 - › stating of job results (47%)
 - › examination of trainings by participants (40%)
 - › evaluation by officials (38%)
- Only the very big companies with more than 1,000 employees use test and examens.

- Almost one fifth of all companies do not have any evaluation at all.

f) Expenditures for continuing education and vocational training are cost, most companies are not really used to deal with. Mostly they are not fixed in the financial budget as a special position but scattered round in different cost areas.

One of the remarkable overview in Reinhold Weiß's survey shows very impressively how much the expenditures per employee differ, responding to training possibilities:

- the expenditures for seminars and workshops - tradition-oriented face to face teaching - are by far the highest: more than 1,000 DM per employee;
- the cost for training-on-the-job rank in the second place with 380 DM per employee, followed by cost for information events with only 186 DM per employee.

A cost-project in 1987 shows that the private industrial sector invested in:

- Education and training - 26.7 billion DM
 - › Training-on-the-job - 7.3 billion DM
 - › Seminars, workshops, etc. - 12.5 billion DM
 - › Special information events - 4.1 billion DM
 - › Trainers and others - 2.8 billion DM

There also exists quite a remarkable correlation between the size of a company and the training cost per employee to be trained.

Whereas in a company with more than 1,000 employees the total cost per trainee is 1,789 DM

- › this rises to 2,493 DM in companies with

up to 99 workers,

- › jumping to 4,219 DM per capita in enterprises with up to only 9 workers.

This means a dramatic disadvantage to small-sized firms. Consequently, learning and teaching facilities have to be created aimed at a fair reduction of training cost for SMEs.

Outlook

Quite unfortunately, the data available on cost and effect of advanced learning technology are very limited. This is especially true concerning the evaluation and controlling of training. It appears mandatory to develop and provide the theoretical and practical means for that purpose.

A few general conclusions, however, may be drawn:

- Big companies are already using or are on the verge to apply advanced learning and teaching methods and tools.
- However, there is a dramatic demand not yet met at all, of middle and small-sized firms to modern training methods. This holds not only for highly industrialized countries such as Germany but, even more, for less advanced societies.
- The cost per trainee in middle and small sized companies is significantly higher than in large organizations.

One of the main reasons for that is the fact that SMEs are forced to use classical, most cost effective face-to-face teaching. Modern training aids cannot be developed in-house. Consequently, they have to be provided from outside, a challenge for DELTA.

Parallel Working Group 3B

Learning efficiency of new technology

Glyn Martin, The Open University

Curriculum Vitae

Glyn Martin graduated in Physics from Imperial College, London University and then spent three years at Hull University researching into satellite broadcasting. From 1971-73 he taught Electronic Engineering at Sunderland Polytechnic.

In 1973 he joined the Open University as a Lecturer in Electronics, during which time he has written courses in Telecommunications, Electronics, Computing, Instrumentation and Engineering Design. In 1984 he became Director of the University's continuing education courses for engineers. In 1987 he helped to form the European Association SATURN and was elected as the first President. Since 1989 he has held the post of Director of European and International Development for the University.

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Abstract

Introduction

Two interlinked topics are raised by this working group, namely the pedagogical efficiency of a learning technology and cost effectiveness of a learning technology. There is a need for working definitions of these concepts before progress can be made in quantifying them.

Flexible and Distance Learning: pedagogic efficiency

What types of efficiency?

If a distance learning technology is the only way of learning (e.g. because of geography or subject area) the concept of efficiency is meaningless.

Students learn more efficiently

With what do you compare a learning technology?

How do you measure efficiency? In terms of

- speed
- more retention
- more relevance to work of student
- copes with all student levels
- more open
- standardised quality, etc

Flexible and Distance Learning: cost effectiveness

Again, what is the baseline for comparison? What costs should be included? High technology learning systems generally have large development cost per course. Indeed, the higher the technology the higher the development cost. One CBT developer in the UK quotes the increasing number of hours needed to develop one hour of CBT learning material over the past eight years. In other words, is the trend towards state of the art flexible learning really chasing just one form of efficiency up a path that leads to more and more development costs. In turn, this necessitates larger and larger numbers of sales to achieve a payback.

Comment

From the above, issues of definition seem to need to be discussed, but maybe we should not take

ing director said recently "Open, flexible distance learning are yesterday's terms - all that matters now is learning".

Therefore, chasing a 10% improvement in learning efficiency, however it is defined, may be much less important than getting the whole training system right. In other words, a system in which the learning is appropriate and students are motivated to reach their full potential through a variety of options.

Case studies of good practice

'Good practice', ie 'the achievement of learning goals through the appropriate application of learning technology', in technology-based learning environments formed the basis of EIOL case studies involving 12 existing open learning organisations. The project judged as good practice:

- the use of self-instruction text,
- practical computing and live tutoring in the context of imparting a good working knowledge of computers to accountants,
- the introduction of basic mathematical skills to technology students and the learning of a computer language by university students, all in a distance-learning environment.
- The use of CBT for the dissemination of information on new products and procedures and for flexible simulation in company staff training.
- The use of interactive videotex for the teaching of mathematics to economists.
- The use of video lectures, in combination with printed notes or books, computer-based exercises and electronic-mail based tutoring in providing a comprehensive introduction to expert systems at post-graduate levels.
- The use of interactive video, with printed materials and audio cassettes as a substitute for field-trips in a Masters-level Geology course.
- The use of text and practical experiments in remote training and up-dating of car electricians.
- The use of CBT plus video for staff training in the context of a financial institution.

An important element, therefore of cost-effectiveness is the pedagogic efficiency of the learning material, as well as the direct cost element.

Parallel Working Group 3C

Policy issues

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Abstract

In every single market public policies are an element to be considered in order to explain with full awareness the size of the market, the number of sellers and buyers, the product and pricing behaviours of producers and so on.

This is true for the consumer goods markets, that may resent from competition policies or consumer's protection legislation; it is, of course, much more important for those sectors, like education and training, in which the service produced has a social relevance that justifies the intervention of public authorities.

This is the reason why the DELTA-EIOL project includes a study on policies within its action line aimed at studying the actual and potential European market for open learning.

This "market" is very recent in some countries and not yet existing in others; the actors are difficult to be identified precisely. A wise assumption to be made is that such a market is only a part of the more general and complex education and training market, and is related in a rather original way with other more consolidated markets like publishing, software, telecommunications, audiovisuals.

Since it is part of the education and training market, public authorities have a very relevant, often dominant role: the conditions of competition are so altered by the public presence that many categories of classical industrial economics are hardly useful.

In the DELTA documents frequent references are made to the role of public policies to create fa-

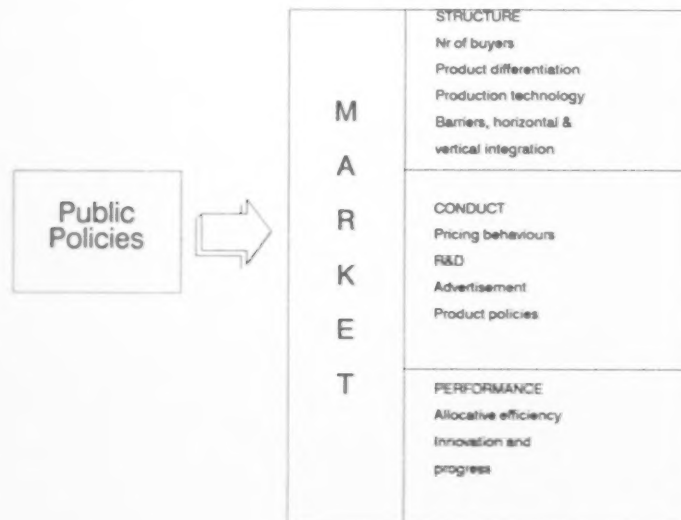
vourable conditions for the development of ALT market; one could say that public policies may also create unfavourable conditions, for example not recognizing titles achieved via distance learning or keeping telecommunication systems inefficient or too expensive.

Public bodies may be funded to produce good quality learning packages to be sold at a "political" low price; though a very popular choice, this could push competing private producers out of the market and prevent the development of a healthy sector. In any case, the fact that a considerable amount of education and training is funded by public authorities and sold at a low pricing is a determinant of product and price behaviours of private companies active in the field of ALT.

The public sector may be, and actually is, the most important customer for a lot of these companies, and through its choices often makes the success and the failure of small specialised business, which are not able to survive without contracts with the Public Administration, including in this schools and training centres.

Legislation is another obvious example of the weight of public policies: the recognition of titles, the setting of standards, the provision of financial or fiscal incentives to producers or buyers of ALT products can influence in a dramatic way the development of a market.

Of course, these are only a few examples of the influence of public policies on the ALT market: there are many other ways for public authorities to interfere (using the verb in its neutral meaning), and the interference should be justified in terms of benefits that could not be achieved without public intervention.



From an economic point of view, there are three main reasons for considering a good as a "public good", that deserves public interference in the market:

- because it has intrinsic characteristics that result in "externalities", i.e. social benefits the value of which is not effectively marketed.
An example of this can be the benefit of non - work - specific training and education that a company is not willing to pay for its employees, because they can use it to find another job; the society as a whole, on the contrary, wants the public sector to intervene to provide it or to help its provision by private actors;
- because there are imperfections in the market, like lack of information on products and prices, monopolistic situations, slow adjustment times by private actors, lack of accepted rules in a new market;
- because the good is not accessible by disadvantaged sections of society who could benefit from it, or because the nature and quality of the good is different (or perceived as different) depending on who provides it and notably on the public or private nature of the provider (e.g. television programmes, health services, research). Both categories of reasons fall under the class named by economists as "social environment" explanations.

Open learning presents many features of a "public good" that justify public intervention in the market: each action can be explained referring to one or more of the three categories of "economic" motivation. This is the reason why a classification is proposed in the next paragraph, which takes them

as one of the matrix dimensions.

Of course, we do not think that these three categories have been the real motivation of each single policy maker in this field: imitation, vested interests, personal prestige, cultural and political background can be very important in the decision taking process, but for analytical purposes we think that we should concentrate on the economical and social motivations that have been introduced.

Thirteen types of public policies to support the open learning market have been identified: in the following matrix they are related with the three categories of motivation discussed in the previous paragraph and two other criteria for classification are used: the direction on the policies (towards the demand, the supply, or both, through intervention on market imperfections) and the institutional levels (C = European Community or international, N = national, R = regional or local) where they tend to be adopted more frequently.

By demand-side policies we mean actions that aim to intermediate (schools, companies, training centres) and final users of ALT, by supporting individual consumption or the introduction of ALT in training activities.

Supply-side policies are geared to stimulate the production of ALT providing financial incentives, promoting R & D, etc. Both demand and supply would benefit from policies that enhance the functioning of the ALT market. The scheme is not explained in details in the following text, since it should result clear from what was said above. The different kinds of policies and their impact are described below.

MOTIVATIONS FOR PUBLIC INTERVENTION IN THE MARKET

Externalities	Improved efficiency Wider public for a public good like education
Market Imperfections	Improved information on the market Improved competition Consumer protection
Social Environment	Socially disadvantaged groups Organisationally disadvantaged groups Different quality of public/private supply

NATURE \ AIMS	EXTERNALITIES		MARKET IMPERFECTIONS			SOCIAL ENVIRONMENT			DIRECTION	INST. LEV.
	IMPROVED EFFICIENCY	BENEFITS OF WIDER PUBLIC FOR EDUCATIONAL AND TRAINING	MARKET INFORMATION	COMPETITION POLICY	CONSUMER PROTECTION AND CERTIFICATION	SOCIALLY DISADV.	ORGANISATIONALLY DISADVANTAGED GROUPS (SDG)	QUALITY OF PUBLIC/PRIV. SUPPLY		
1. Financial support to consumers		P	S	S		P	P		D	R
2. Financial support to producers	S	P		P				S	Su	Na, C
3. Public tenders	P		S	P				S	M	N, R
4. Prices and tariffs		P		S		P	S		M	Na, R
5. R & D	P			S	S			S	Su	C, Na
6. Institution building	S	P		N	P	P/S	S	P	M	Na
7. Technical assistance	P			P	S			S	Su	R
8. Legal/regulatory policies		P		S	P	P	S	P	M	Na
9. Agreements and codes of conduct		P			S		P		M	Na
10. Information and advertising		S		S	S	S	P		M	C, N
11. Technological infrastructure	P	P		S		S	S		Su	Na
12. "Human infrastructure"	P	P		S	S	P	P	P/S	Su	Na, R
13. Direct provision of ALT products	S			N	S/P	S		P	Su	Na, R

Legenda:

P = Primary motivation
D = Demand

S = Secondary motivation
Su = Supply

N = May have negative impact
M = both D and S

C = Country/national
Na = National

R = Regional/local

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The three following schemes give an overview of the impact of the thirteen discussed kinds of ac-

tions on market structure, conduct and performance.

O.L. Policies and their Impact on the Market Performance

MARKET PERFORMANCE

	Market growth	Market efficiency	Technical progress
Financial Support (C)	***	**	**
Financial Support (P)	**	.	**
Public tenders	***	**	**
Price & tariffs	***	.	**
Research & development	.	.	***
Institution building	**	.	**
Technical assistance	.	**	***
Legal/ regulatory	**	***	**
Agreements norms	***	**	.
Information	**	***	.
Physical infrastr.	**	**	***
Human infrastr.	**	**	***
Public supply	**	.	**

O.L. Policies and their Impact on the Market Conducts (Suppliers)

MARKET CONDUCT

	Price policy	Product policy	Advert'g policy	Research & innovat'n
Financial Support (C)	..	..	...	.
Financial Support (P)	...	...	...	..
Public tenders	..	..	.	..
Price & tariffs	...	..	..	..
Research & development	..	...	.	...
Institution building	...	..	.	.
Technical assistance	.	..	..	..
Legal/ regulatory	..	..	..	.
Agreements norms	.	..	..	..
Information	..	...	...	.
Physical infrastr.	..	...	.	..
Human infrastr.	.	..	.	..
Public supply	...	...	..	..

O.L. Policies and their Impact on the Market Structure

MARKET STRUCTURE

	area of compet.	number sellers	number buyers	techn'l level	economies scale	cost structure	vertical integr'n	products differ'n
Financial Support (C)	...	...	..	.	..	..	.	.
Financial Support (P)	...	...	..	...	...	...	...	...
Public tenders	...	...	..	...	...	...	...	...
Price & tariffs	...	...	...	...	...	...	...	...
Research & development	.	..	.	...	..	..	.	...
Institution building	.	..	..	..	-	-	.	.
Technical assistance	.	..	.	..	-	.	.	.
Legal/ regulatory	..	...	...	..	.	-	.	...
Agreements norms	.	..	...	..	.	.	.	..
Information	.	...	...	.	.	.	-	..
Physical infrastr.	..	...	...	..	..	..	.	..
Human infrastr.	..	..	..	..	.	..	..	..
Public supply	...	...	...	..	.	.	.	..

This list of policies for the development of open learning is quite comprehensive; however, it should be stressed that the applicability and effectiveness of each policy depends on the context in which it is applied. No policy is good per-se: the likely impact of each policy has to be assessed in terms of actual market structure and functioning.

On the whole, we can observe that:

- 1) supply side policies tend to prevail in Europe;
- 2) infrastructure policies tend to be unbalanced on the technological or, more rarely, on the "human" side;
- 3) specific legislation and tariff policies are seldom found;

4) institution building policies are no longer so popular as they were in the past;

5) a certain specialisation seems to emerge between different institutional level: at Community and transnational level policies to correct market imperfections are a priority, at national level policies to provide externalities are privileged (notably the improvement of efficiency of national training systems), whilst at regional and local level policies of the category named "social environments" (support services for disadvantaged target groups, public provision of products and services) seem to be more popular.

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